Name _____

Across the Miles

Use **USA Time Zones** map to find the times.

1. If it is 4:20 p.m. in New York, what time is it in Minnesota? _____

2. If it is 6:38 a.m. in Arizona, what time is it in Illinois? _____

3. If it is 2:15 a.m. in Vermont, what time is it in California? _____

4. If it is 12:30 p.m. in Texas, what time is it in Utah? _____

5. A plane leaves New York City, New York at 3:15 p.m. It takes 2 hours to fly to Chicago, Illinois. What **time** is it in **Chicago** when the plane lands?

_____

6. A plane leaves Los Angeles, California at 1:15 p.m. It takes 5 hours to fly to New York City, New York. What **time** is it in **New York City** when the plane lands?

_____

CHALLENGE:

A) How many hours is the time difference between northern Virginia and your country? _____

B) If it is 4:00 p.m. here in northern Virginia, what time is it in your country? _____

Answer Key
Measurement - Obj. 10

"Time Please"

1. Eastern Time Zone 4:00 p.m.
   Central Time Zone 3:00 p.m.
   Mountain Time Zone 2:00 p.m.

2. Central Time Zone 9:00 p.m.
   Mountain Time Zone 8:00 p.m.
   Pacific Time Zone 7:00 p.m.

3. Eastern Time Zone 5:00 p.m.
   Central Time Zone 4:00 p.m.
   Pacific Time Zone 2:00 p.m.

4. Eastern Time Zone 12:00 p.m.
   Mountain Time Zone 10:00 a.m.
   Pacific Time Zone 9:00 a.m.

5. Colorado 5:00 a.m.
   Maryland 7:00 a.m.
   Texas 6:00 a.m.
   California 4:00 a.m.

6. New York 11:00 a.m.
   Arizona 9:00 a.m.
   Illinois 10:00 a.m.
   South Carolina 11:00 a.m.

7. Washington 12:00 p.m.
   New Mexico 1:00 p.m.
   Oklahoma 2:00 p.m.
   Maine 3:00 p.m.

Across the Miles

1. 3:20 p.m.
2. 7:38 a.m.
3. 11:15 p.m.
4. 11:30 a.m.
5. 4:15 p.m.
6. 9:15 p.m.

Challenge - answers will vary.

Geometry

Table of Contents
Geometry

Objective		Page
1	Identify and use words indicating position and size comparison including similar and congruent.	2
2	Identify line as straight or curved. Use letters to name points, lines, and line segments.	8
3	Use letters to identify and name intersecting lines, rays, and angles.	16
4	Measure and draw angles using a protractor.	22
5	Define a 90° angle as a right angle. Identify and draw parallel, perpendicular, and intersecting lines.	28
6	Sort and classify figures as open or closed. Define a polygon as a simple closed curve made of line segments.	36
7	Identify a three sided polygon as a triangle, and sort triangles by their angles - acute, right, and obtuse.	42
8	Sort and classify triangles by relative length of side: equilateral, isosceles, and scalene.	50
9	Know that any polygon with 4 sides is a quadrilateral. Identify by number of sides and use the correct names for pentagon, hexagon, and octagon.	58
10	Classify quadrilaterals by side length and angle relationships and use the names: square rectangle, rhombus, trapezoid and parallelogram.	60
11	Identify the distance around a plane as its perimeter. Find the perimeter of polygons.	70

12	Identify the space inside a plane shape as its area. Find the area of simple polygons.	80
13	Identify, describe and draw parts of a circle: radius, diameter, arcs, circumference, and chords.	90
14	Identify by appearance and use names for the following solids: sphere, cone, cube, cylinder, and pyramid. Sort and classify solids by flat and curved surfaces and the number of vertices, edges and faces.	98
15	Build three dimensional models of solids, counting the number of faces and vertices.	102
16	Build three dimensional figures from drawings or pictures. Make a two dimensional drawing of a three dimensional solid.	112
17	Locate points on a plane, in the first quadrant, with the ordered pairs.	122
18	Use ordered pairs, including negatives, to describe and locate points in a coordinate graph.	128
	Assessment	151

Objective 1: Identify and use words indicating position and size comparison including similar and congruent.

Vocabulary

over/under/on
above/below
left/right
first/last
inside/outside/on
same/larger/smaller
similar/congruent
triangle

Language Foundation

1. Check on the color words red and yellow.
2. Be certain they understand the concept of a line on the page.
3. Discuss a path as a way to get somewhere or from one point to another.

Materials

2 colored counters
Geoboards and bands
Geostrips and brads
Tangrams
Worksheets:
•Line/Closed Path
•Tangram
1/student

Mathematics Component

1. Use Line/Closed Path worksheet to check understanding of vocabulary (such as "Put a yellow counter below the line. Put two red counters above the line.") Use the closed path to check vocabulary such as inside, outside, etc.

2. Using the overhead geoboard, construct a triangle. Ask the students to make a triangle that is smaller than yours with their geoboards. Ask them to check with others at their tables to see who has the smallest triangle. Continue with the same size and larger figures.

3. Give out geostrips and brads. Have students make as many different triangles as they can.

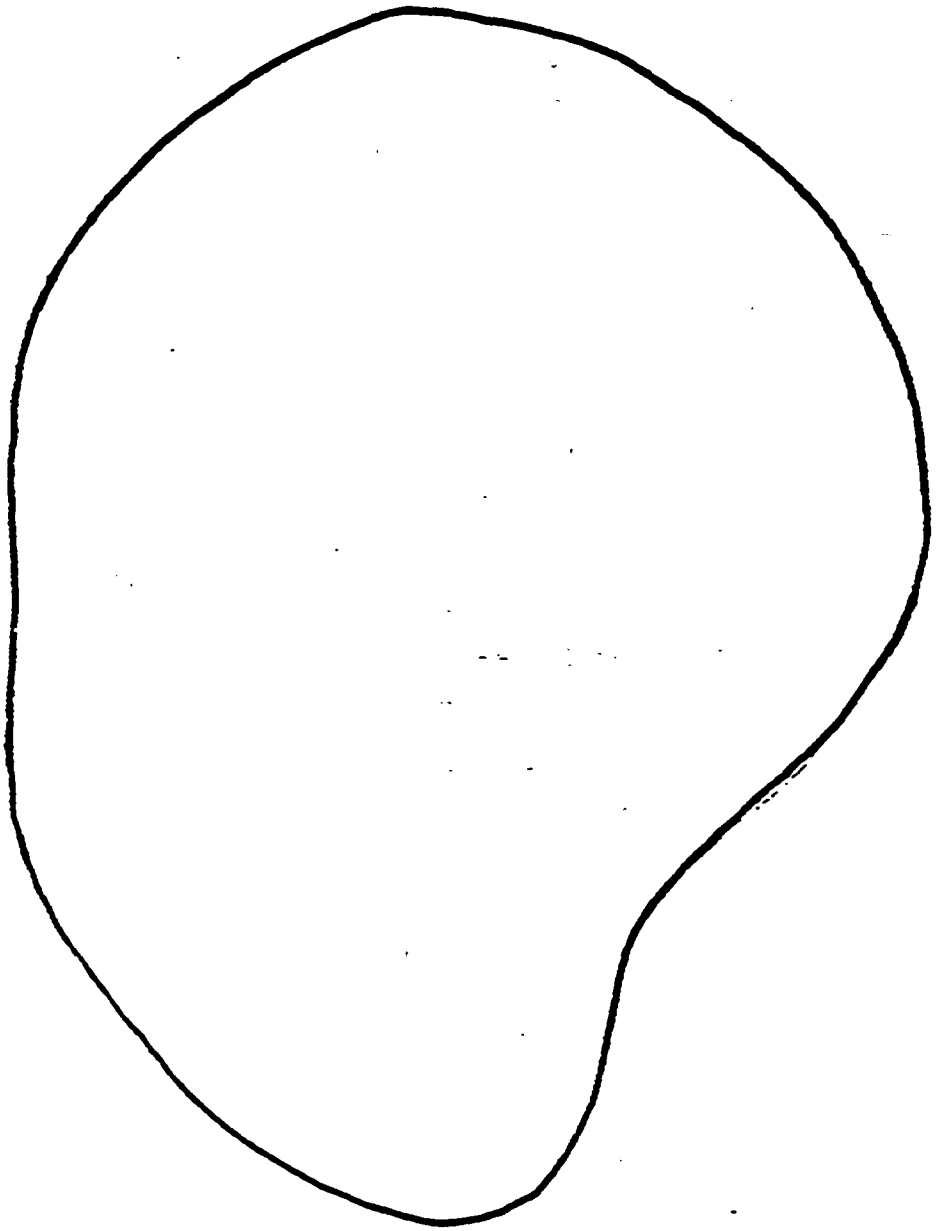
4. Explain the meaning of similar and congruent. Use the geoboard to demonstrate. Use the tangram pieces. Have them find similar triangles in their own set. Have them find the pair of congruent triangles in their own set. Have them work with a partner (so they have 2 sets of tangrams) to find:

    1. all 5 sets of congruent triangles,
    2. the set of congruent squares, and
    3. the set of congruent parallelograms.

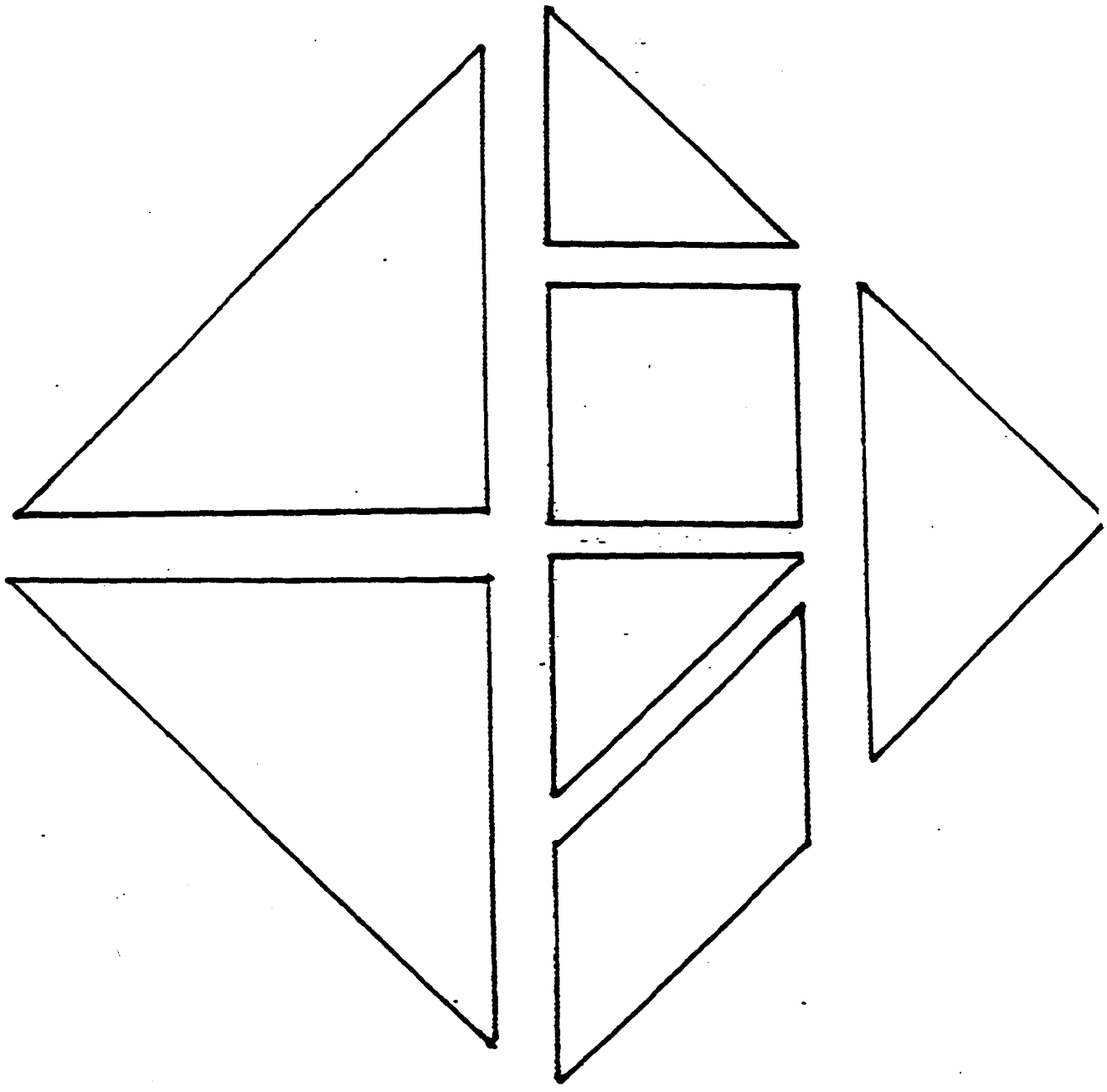
5. Have students cut the Tangram along the lines. The pieces can be arranged into thousands of other shapes. Ask students to form the tangram set into the letters that spell their initials. They can then glue it on construction paper and decorate it.

Line

Closed Path



Tangram



Objective 2: Identify line as straight or curved. Use letters to name points, lines, and line segments.

Vocabulary

point
line
line segment
straight
curved
infinite
shorter/longer

Materials

String
Scissors
Overhead pens
Colored pencils or pens
Wall Chart
Posterboard
Transparencies:
Vocabulary
Dot Paper Example
Worksheets:
•Points
•Dot Paper
1/student

Language Foundation

1. Talk about names and naming things.
2. Review the idea of a path being a way to get from one point to another.
3. There may be some need to discuss the concept of "without end" (infinite) particularly with relationship to lines.
4. Some students may not be familiar with the future tense. Therefore, the use of the word "will", when asking them to predict what will happen, may need to be explained.

Mathematics Component

1. Discuss the meaning of point and that two points determine a path. Using the paper with two points on it, have each student connect the points with a path. Have them measure their path using string. In cooperative groups have them compare the lengths of their strings and the kinds of paths they drew. Have them connect their points with straight lines and predict what will happen with the length of the path now. Have them use their strings to measure the new paths and make comparisons within their groups.

   Have two pairs of students stand and represent points. Have a volunteer make a yarn curved path between one pair of students and another volunteer make a straight yarn path from one student to the other using yarn. Repeat several times with different between the other pair of students. This is a good time to have students predict how long each path is and which is the longer path. Then have other volunteer measure the yarn with either a yard stick or a meter stick. Discuss naming points with capital letters. Draw two points on the overhead and label them, (AB). You may want to the first letter of the students' names to illustrate labeling points. Discuss that a straight line is the shortest distance between two points. Curved lines are longer paths.

2. Discuss the difference between lines (which continue infinitely) and line segments (which are parts of a line). You can have students "become" points and stand next to each other so they get the idea that a line is made of points and that it can keep on going infinitely.

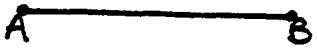
3. Connect two points with a line and ask how to name it. Have the students each draw two points, name them, connect them with a line segment, and name the line segment ($\overline{CD}$). Put up the wall chart and go over it to reinforce these concepts.

4. Pass out sheets of dot paper (and colored pencils if you have them). Have the students put point A anywhere on the paper. Have them put point B anywhere on the paper. Have them connect A and B and write $\overline{AB}$ on it. Have them add point C. Ask what line segments they can now draw. Elicit $\overline{AC}$ and $\overline{BC}$. Have them draw and label $\overline{AC}$ and $\overline{BC}$. Have the students add 1 point at a time and draw and label the line segments. Have them make and name as many different line segments as they can.

Vocabulary Transparency

point A •A

line AB $\overleftrightarrow{AB}$

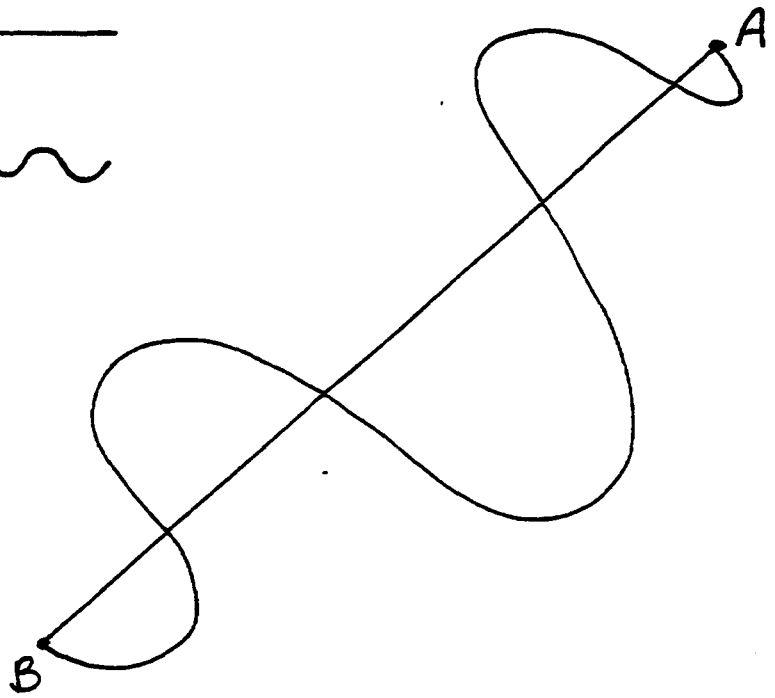
line segment AB $\overline{AB}$ 

straight

curved

infinite (never ends)

shorter/longer

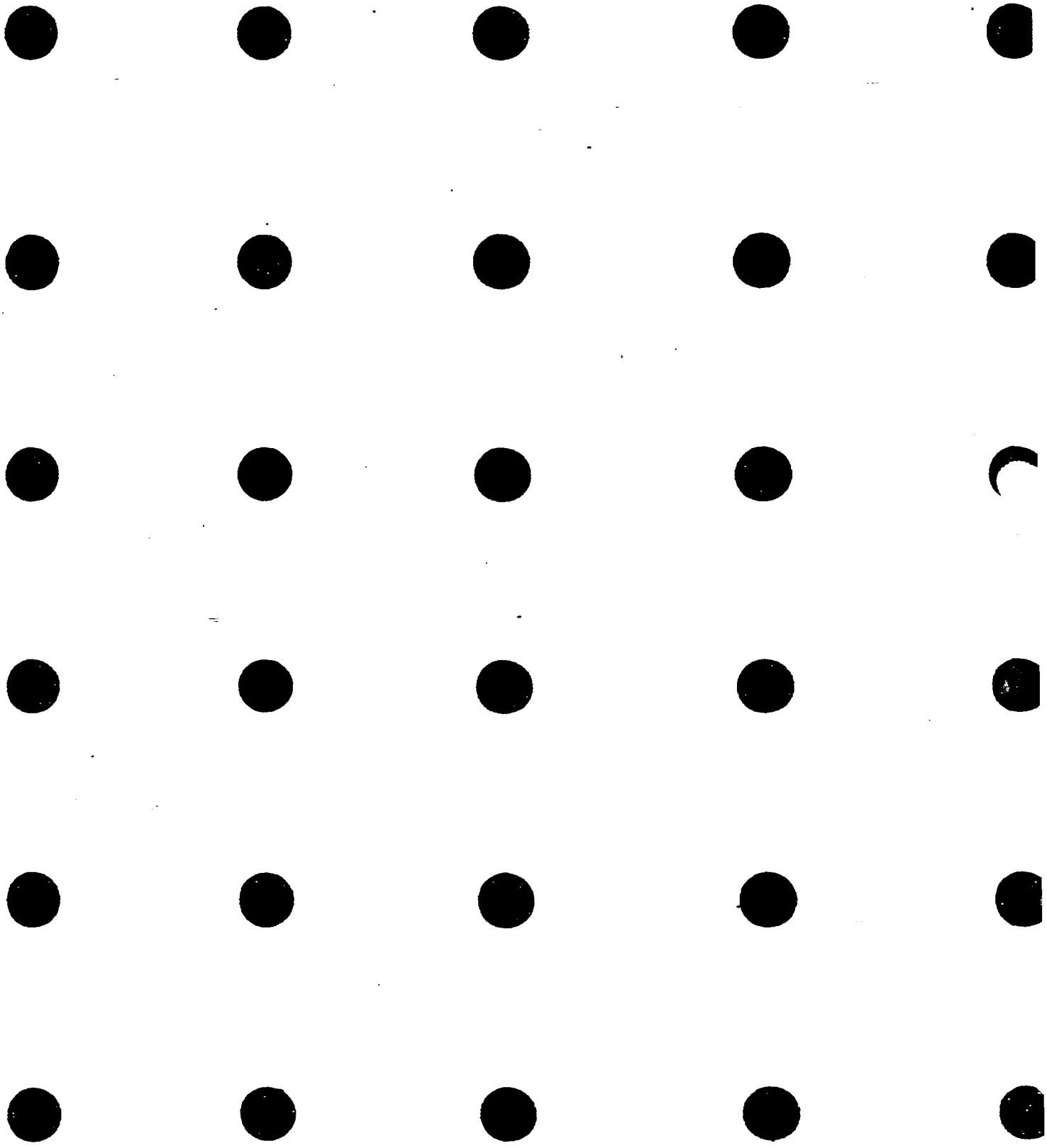


The shortest path from A to B is a _____ line.

The longest path from A to B is a _____ line.

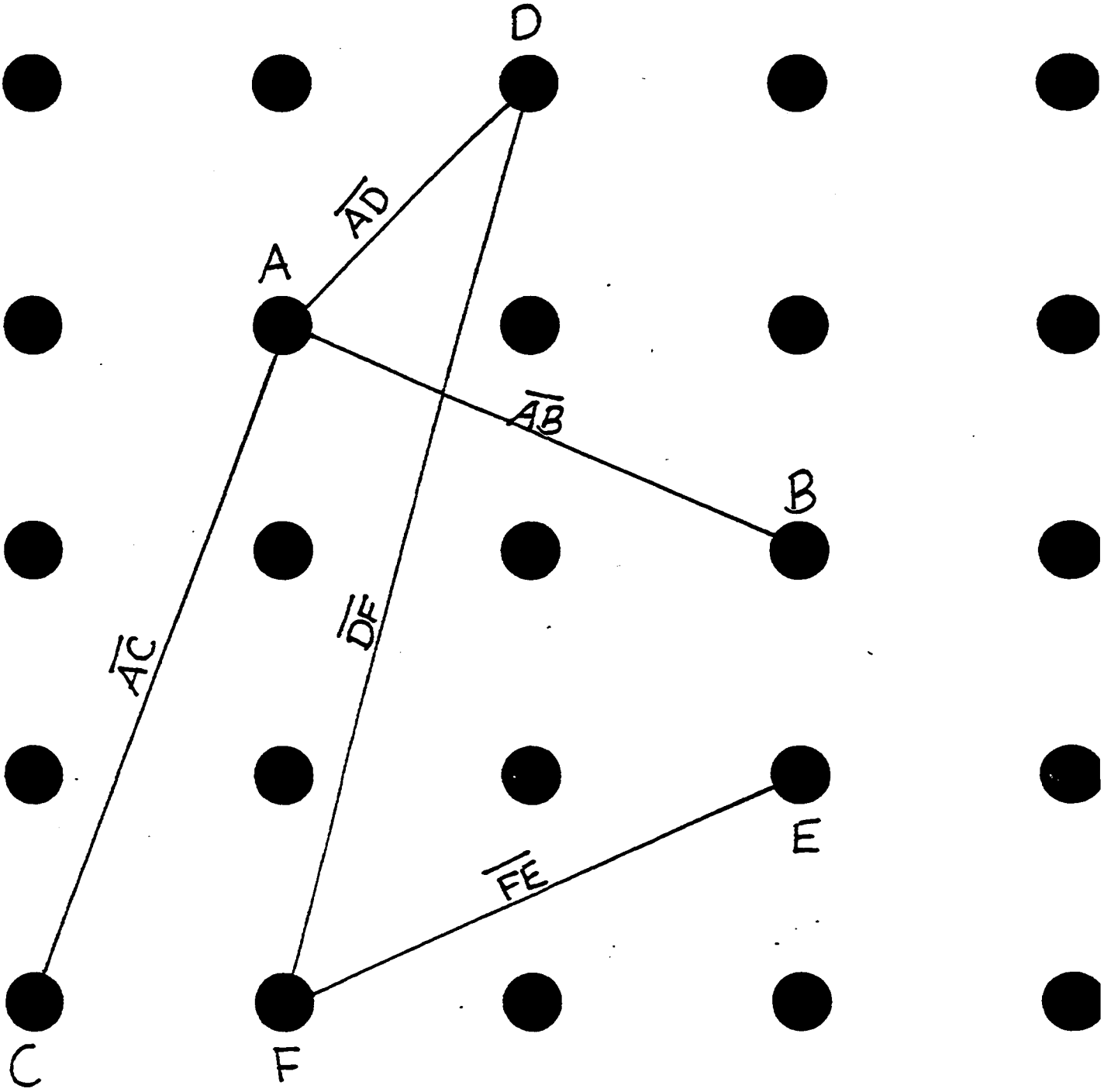
Points

Dot Paper

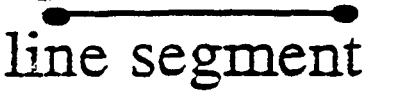
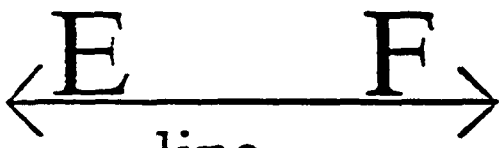


Dot Paper Example

Label all the points.
Draw all the line segments you can.



Wall Chart

Example	Name
A. point	A
C D  line segment	$\overline{CD}$
 E F line	$\overleftrightarrow{EF}$

Objective 3: Use letters to identify and nam intersecting lines, rays, and angles.

Vocabulary

intersect
intersecting
intersection
rays
end-point
angles
vertex

Materials

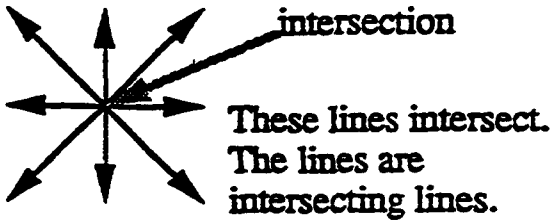
Overhead Geoboard
Geoboards and bands
Paper
Overhead pens
Straight edges
String or yarn
Worksheets:
•Vocabulary Review
•Naming with Symbols

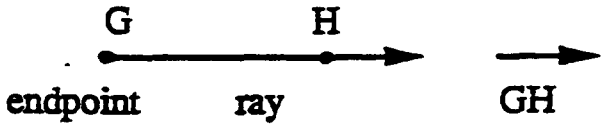
Language Foundation

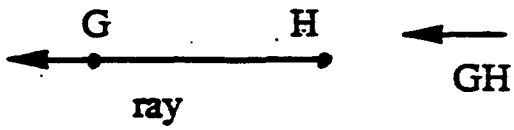
1. Review the words **line** and **line segment**, how to designate them symbolically, and how to name them.

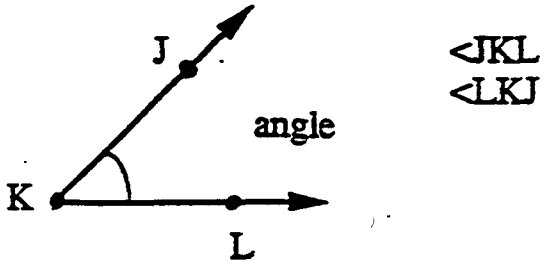
2. Review **infinite** in relation to lines and then extend the idea to rays which have one endpoint but extend infinitely in the other direction.

3. Add the following examples to the wall chart:









Mathematics Component

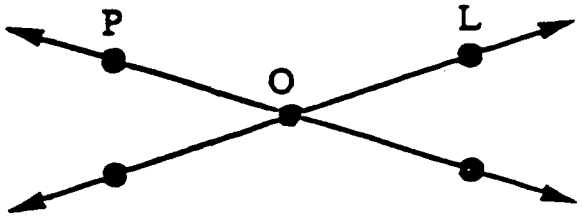
1. Make a line on the geoboard. Make another crossing it. Have students do the same. Explain that 2 lines that cross are said to intersect and the point where they cross is the intersection. Add another line that intersects the two at the same point. Discuss the number of lines that can intersect at one point (an infinite number).

2. Have students put point A on their paper as you do it on the overhead. Have them draw line $\overleftrightarrow{LM}$ through A. Draw line $\overleftrightarrow{PQ}$ through A. Discuss that $\overleftrightarrow{LM}$ intersects $\overleftrightarrow{PQ}$ at point A.

3. Review line ($\overleftrightarrow{AB}$) and line segment ($\overline{AB}$) and the difference in the two. Now write $\overrightarrow{AB}$ and ask them to discuss in their groups what they think this is a symbol for and to come up with a group drawing of the symbol. (Elicit that it is part of a line and has one endpoint at A, the beginning, of the ray but extends beyond B.) After you have an accurate picture of $\overrightarrow{AB}$, ask what is different about $\overrightarrow{BA}$? Explain that these parts of a line are called rays. Draw ray $\overrightarrow{EF}$ on the overhead and ask the students to name it.

4. Have the students draw $\overrightarrow{CD}$ and label it. Now have them draw $\overrightarrow{CG}$ and label it. (Tell them that both rays have the same end point and not to draw a second point C.) Have them check a partners drawing for accuracy. Explain when two rays have the same end point they form an angle. Explain how to name the angle starting at the point on a ray, then the common end point, and then a point on the other ray, in this case $\angle DCG$ or $\angle GCD$. Have the students repeat the steps for the rays $\overrightarrow{RS}$ and $\overrightarrow{RT}$ and have them name the angle. Have the students draw $\angle LMN$ and check each others work.

5. Put the following diagram on the overhead and have the students work together to name four angles formed by these intersecting lines.



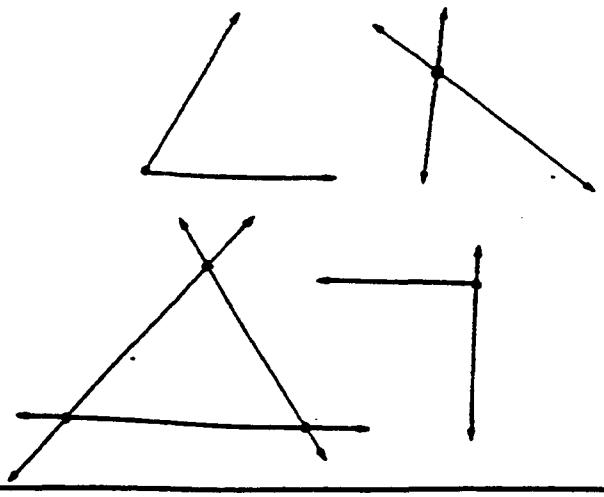
6. Label the students as points. Use string or yarn to let them form lines, line segments, rays, and angles. For homework, have the students draw 2 intersecting lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ which intersect at point N. Have them name the four rays and the four angles formed by these 2 lines.

7. Pass out Naming with Symbols worksheet. Have students name with symbols every different point, line, segment and ray in the figure. Point out that segment $\overline{LM}$ and segment $\overline{ML}$ are the same segment and line $\overleftrightarrow{LM}$ and line $\overleftrightarrow{ML}$ are the same lines but that ray $\overrightarrow{LM}$ and ray $\overrightarrow{ML}$ are two different rays. Also note that ray $\overrightarrow{ML}$ and ray $\overrightarrow{MO}$ are the same rays.

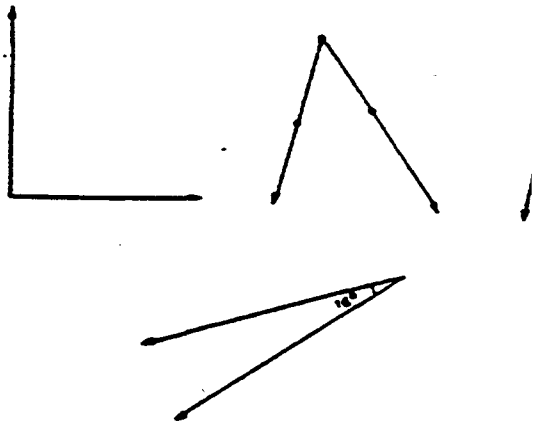
8. Review the vocabulary words briefly each day. Use the Vocabulary Review Worksheet.

Vocabulary Review

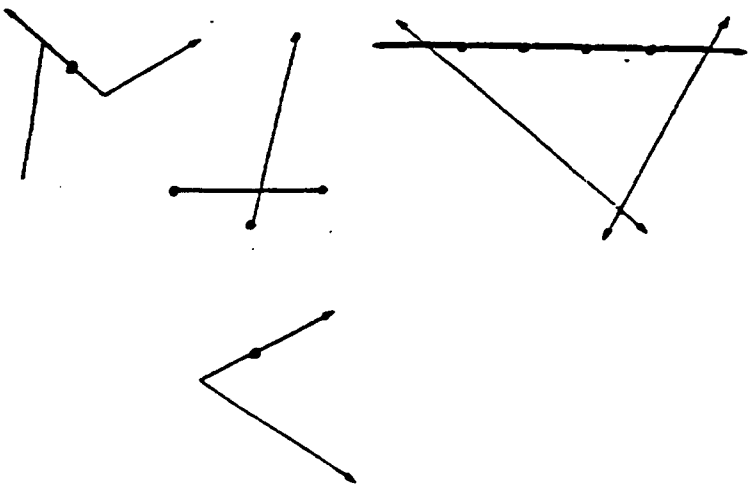
Each point is a vertex:



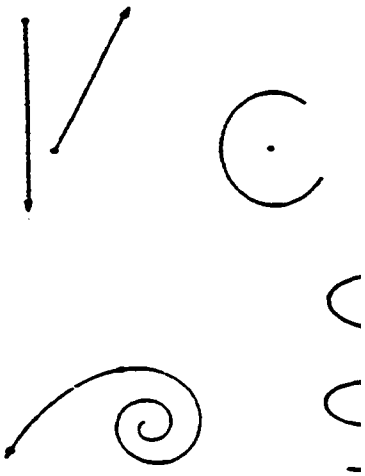
Each of these is an angle:



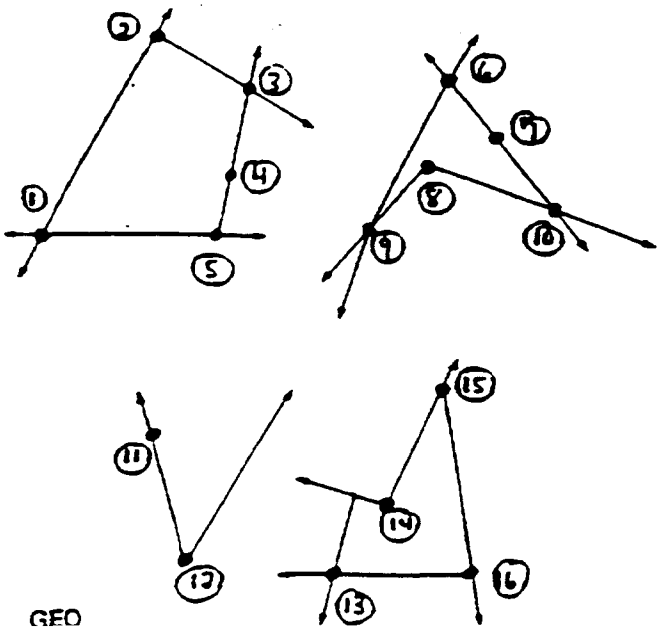
None of these points are vertices (more than one vertex, plural):



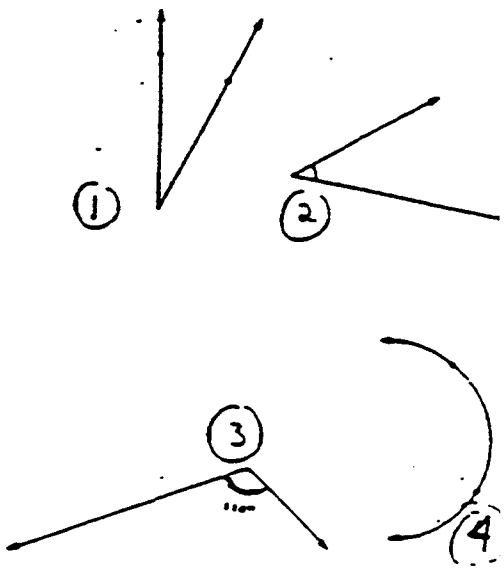
None of these is an angle:



Which points are vertices?



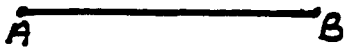
Which of these are angles?



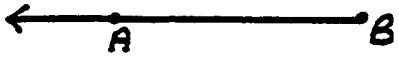
Give the letter of the correct answer.

_____ 1. Name the figure:

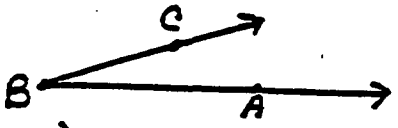
a) $\overleftrightarrow{AB}$ b) $\overrightarrow{AB}$ c) $\overline{BA}$ d) $\overrightarrow{BA}$

_____ 2. Name the figure: 

a) $\overleftrightarrow{AB}$ b) $\overrightarrow{AB}$ c) $\overline{BA}$ d) $\overrightarrow{BA}$

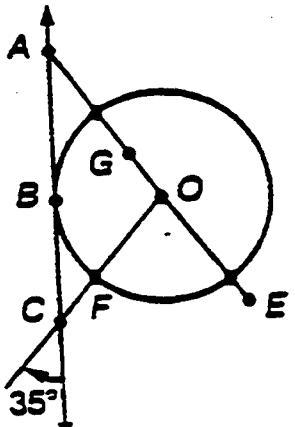
_____ 3. Name the figure: 

a) $\overleftrightarrow{AB}$ b) $\overrightarrow{AB}$ c) $\overline{BA}$ d) $\overrightarrow{BA}$

_____ 4. Name the figure: 

a) $\angle CAB$ b) $\overrightarrow{AB}$ c) $\angle CBA$ d) $\overrightarrow{BA}$

Use the figure at the right:



_____ 5. Name a ray:

a) $\overrightarrow{AB}$ b) $\overrightarrow{CAB}$ c) $\overline{CBA}$ d) $\overleftrightarrow{BA}$

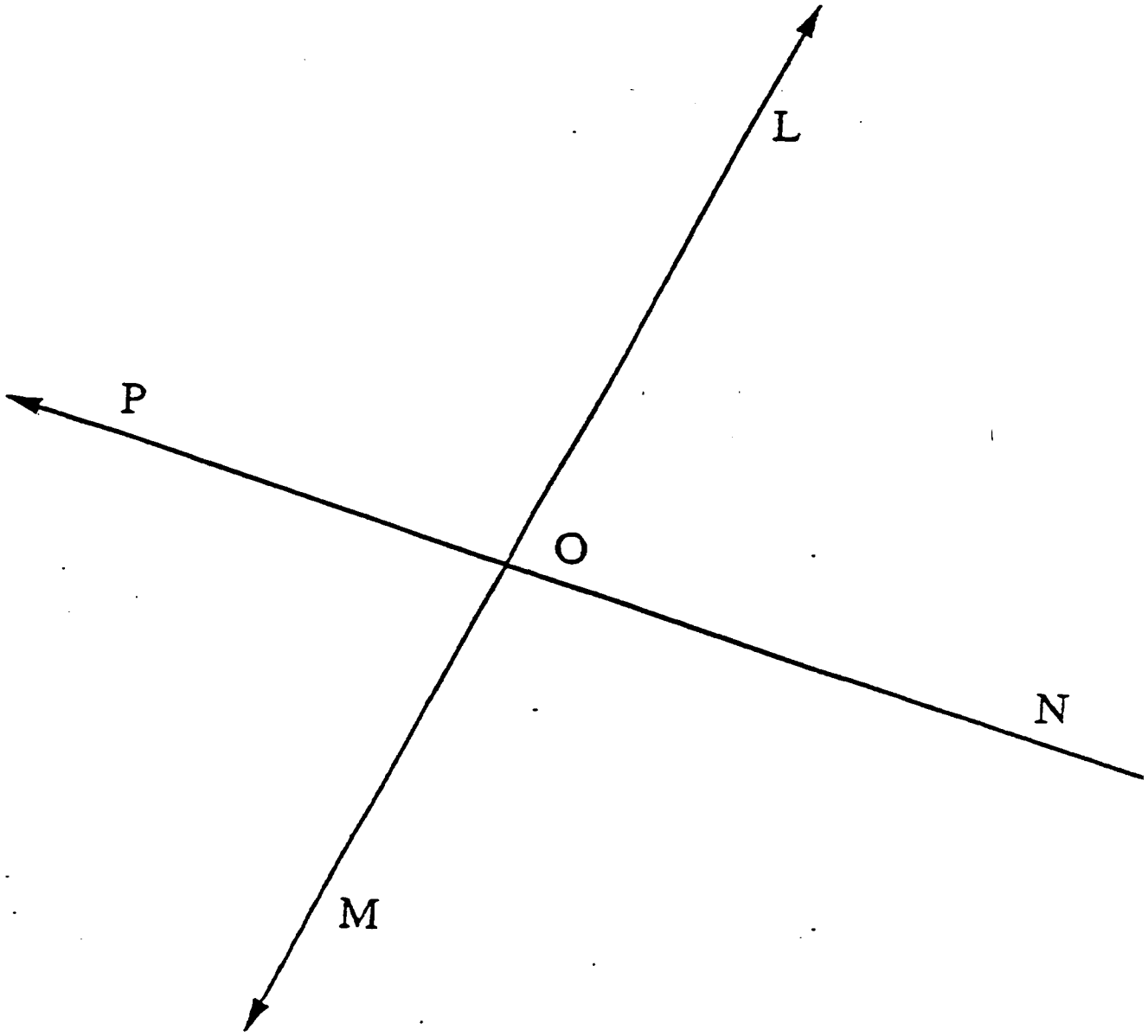
_____ 6. Name an angle:

a) $\angle CAB$ b) $\angle FOG$ c) $\angle OFC$ d) $\angle OGE$

_____ 7. Name a segment:

a) $\overline{CAB}$ b) $\overrightarrow{AB}$ c) $\overline{OE}$ d) $\overleftrightarrow{BA}$

Naming with Symbols



Objective 4: Measure and draw angles using a protractor.

Vocabulary

measure
protractor
degree
extend
length
width
height
volume

Materials

Protractors
Straight edge
Plain paper
Overhead
3 x 5 cards with a different angle measurement written on each (page 27)
Overhead angle maker (Copy 2 rectangles at bottom of this on a transparency, cut them out and follow step 4 of Language Foundation.)
Transparencies and Worksheets:
•Angles
•Measure and Name Angles
1/student

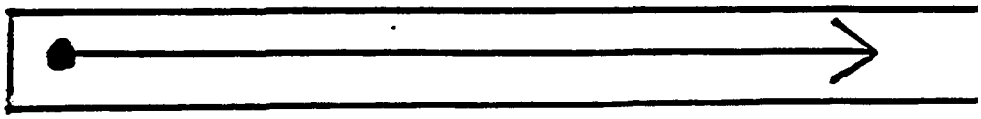
Language Foundation

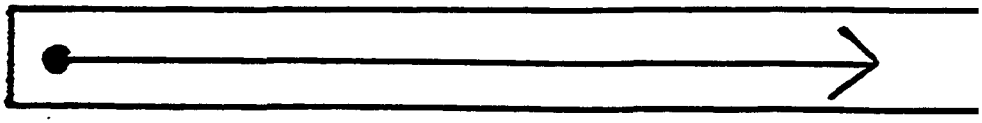
1. Discuss the concept of measuring as a way of comparing things or people. (He is 6 inches taller than she is) You may have to back up and do some simple linear measuring activities of objects using paper clips and rulers.

2. Have the students help you make a list of things they have seen used as measuring tools such as paces, rulers, spans, etc.

3. Have them make a list of things that are measured such as weight, length, etc.

4. Put the two rays of the overhead angle maker together with a thumb tack sticking up through both endpoints. Place the hole in the protractor over the point of the thumb tack. Leaving one ray along the zero degree line, move the other ray up from zero to form (and measure) the desired angle.





Mathematics Component

1. Review rays and angles using yesterday's homework.

2. Discuss that we measure angles in degrees and that we use a protractor to do so. Place a transparent protractor on the overhead. Have students note the shape of the protractor. (Elicit that the protractor is half of a circle.) Pass out protractors and have them note that it measures from 0 to 180 degrees. Have students put two protractors together to get a complete circle and note that a complete circle measures 360°. On the overhead draw a small angle, then an angle about 135° and then one about 250° and compare them.

3. Pass out Angles worksheet. Using the transparency demonstrate how to measure the angles using the protractor. Using the overhead angle maker to show moving from zero around to the other ray of the angle. Model measuring ∠EFG then have the students measure it. Have them measure ∠PQR and have them compare their answers. Explain that sometimes you need to extend the rays so you can measure the angle as ∠XYZ. Model this and then have the students do the same.

4. Help the students draw angles by modeling the following steps:

   Draw ray $\overrightarrow{RS}$.
   Place the center of the protractor on R. Be certain to check that the zero degree mark of one scale is on $\overrightarrow{RS}$.
   Starting at the zero degree mark on RS, (use the overhead angle maker) go around the scale to 60° and mark a point T at the 60° mark.
   Draw $\overrightarrow{RT}$.

   Have the students draw a 45° angle, a 90° angle, and a 120° angle. Have them label their drawings and compare them within their groups.

5. To get a sense of what various angles look like have students form 45° and 90° angles with their legs in a mini fitness lesson. While standing have them turn (pivot) 45°, 90°, 180°, and 360°. Elicit that a circle has 360° and half a circle has 180°.

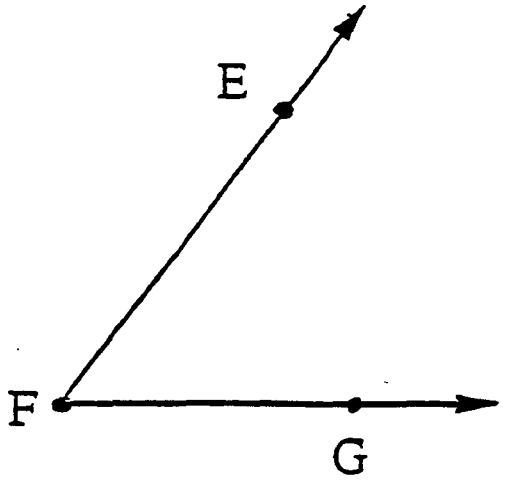
6. Copy page 27, cut out the various angles and glue them on 3 X 5 cards. Pass out the cards to students and have each one draw his/her own angle. Have students trade drawings and measure the other person's angle. Compare the measurement with the original card. Repeat if there is time.

7. Hand out Measure and Name Angles worksheet. Let students work in pairs to complete it.

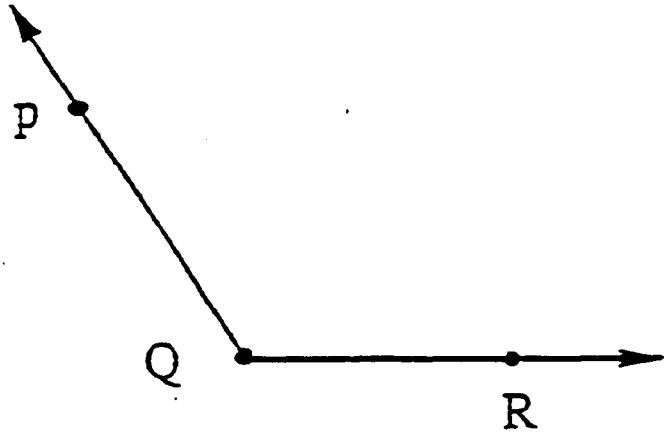
Measure each angle:

Angles

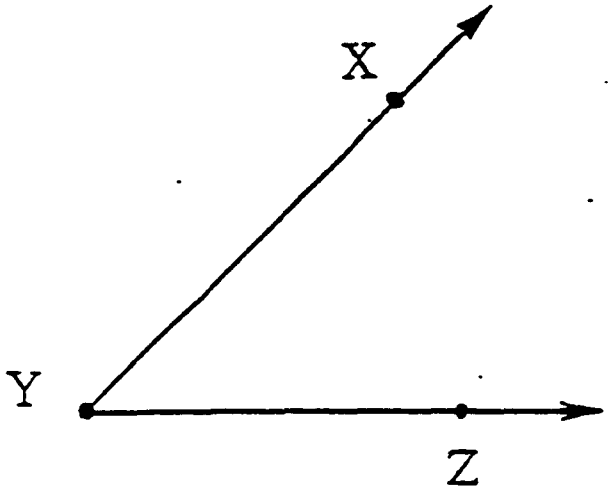
1
∠EFG



2
∠PQR

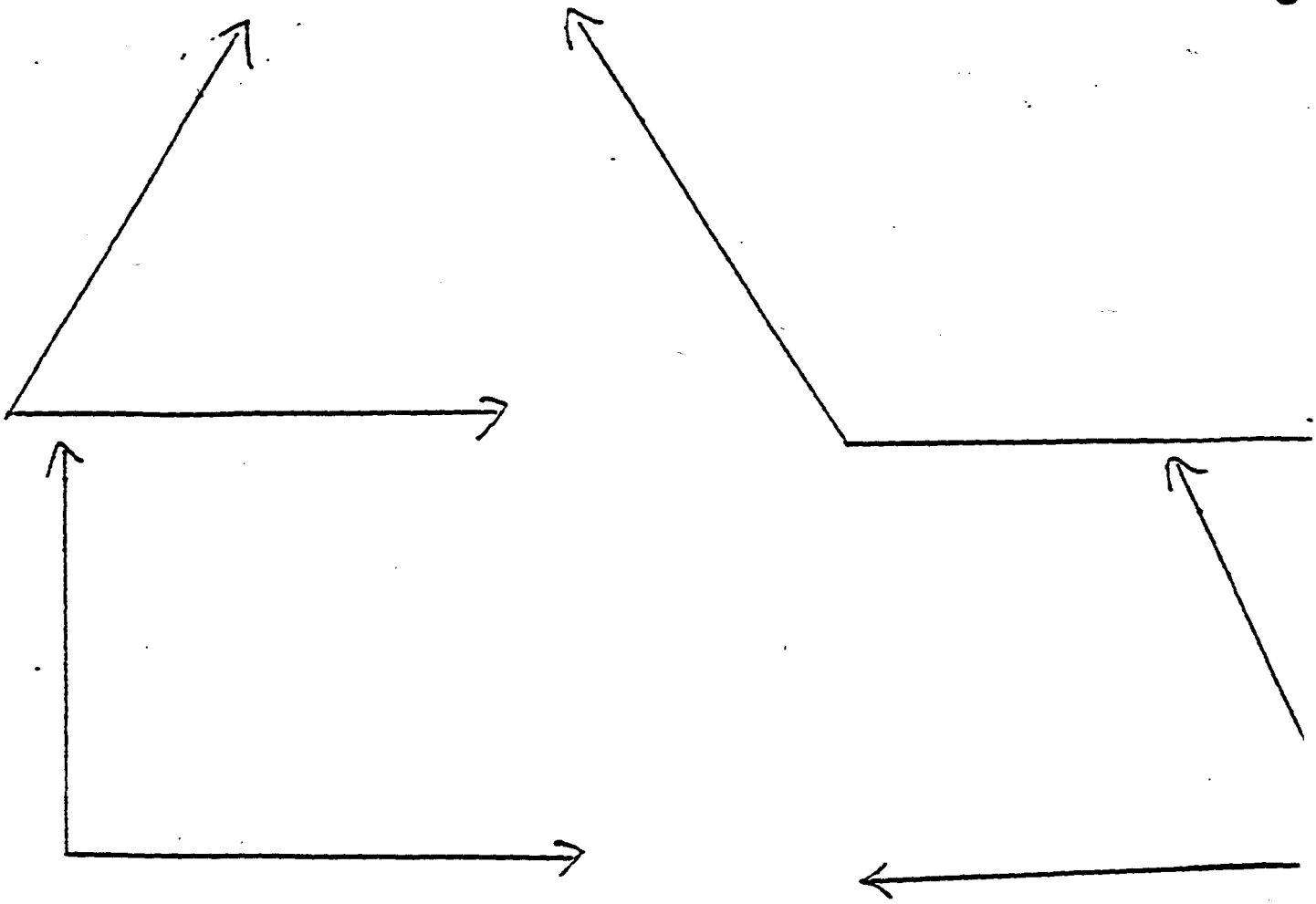


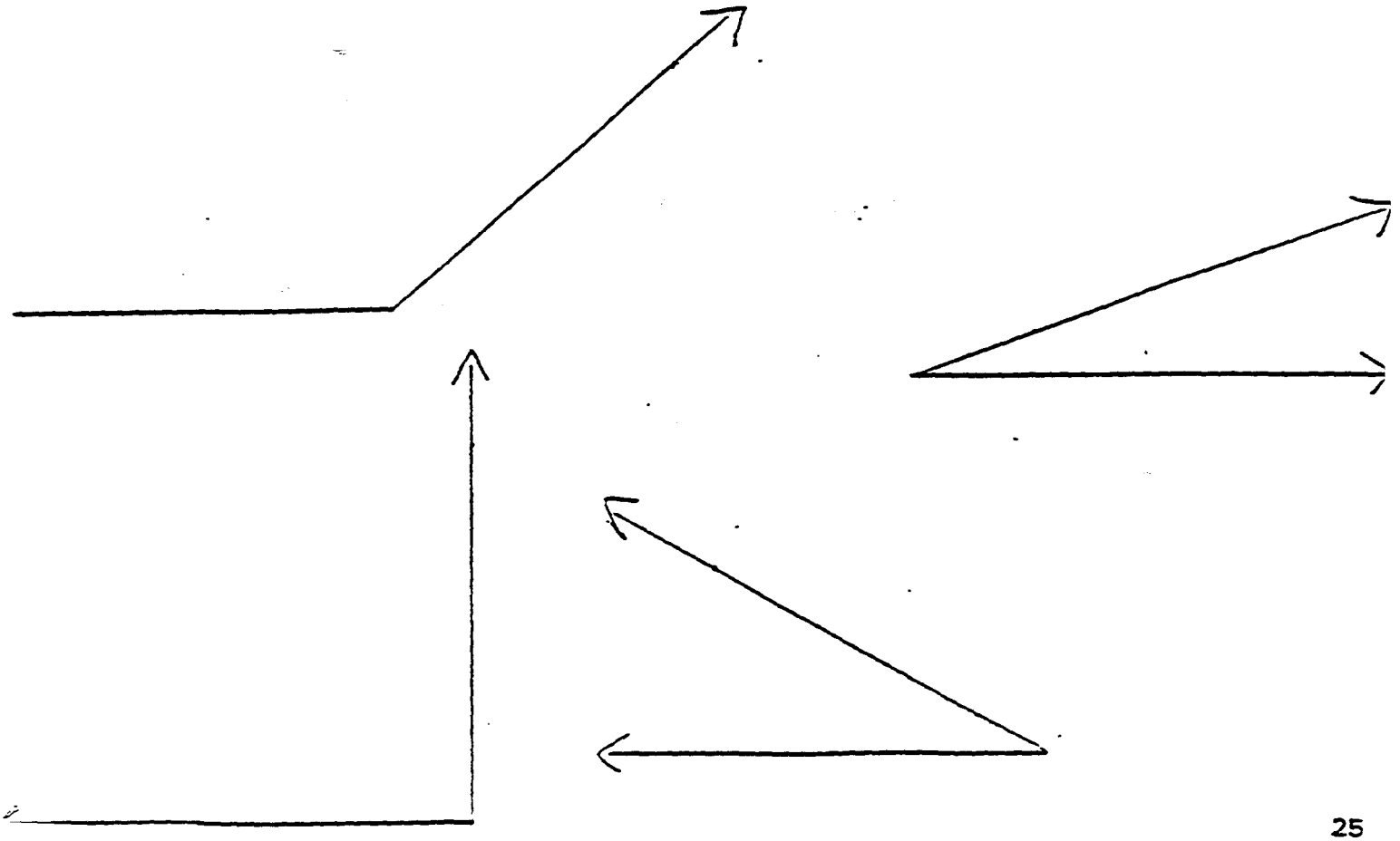
3
∠XYZ



Measure each angle:

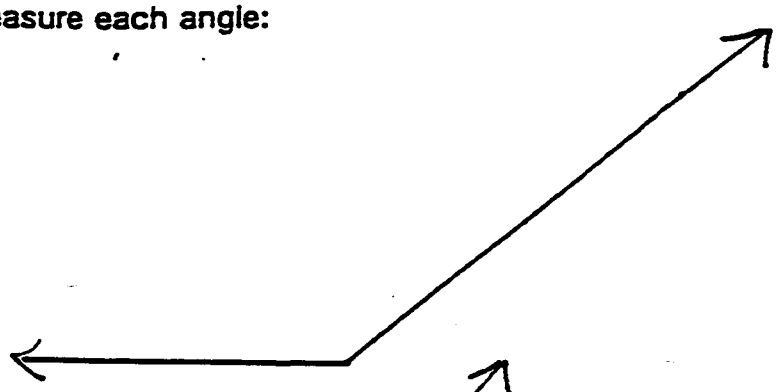
Measure and Name Angl



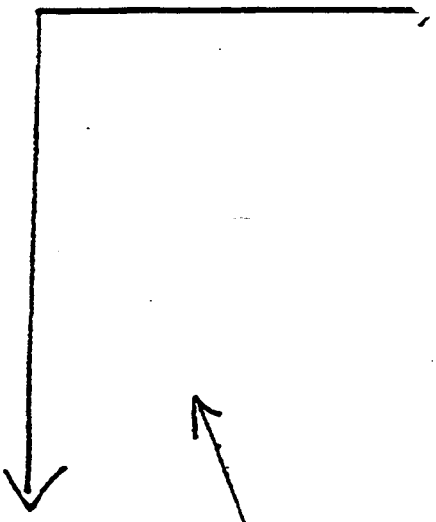


Measure each angle:

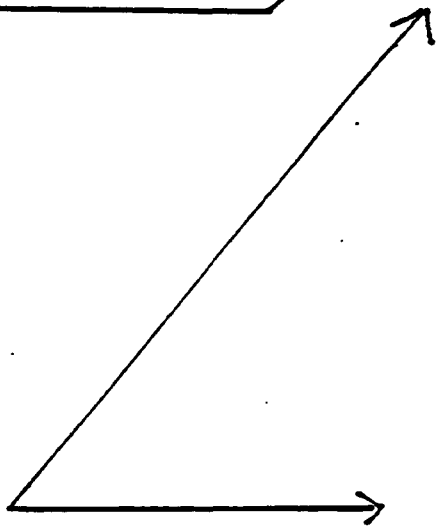
1.



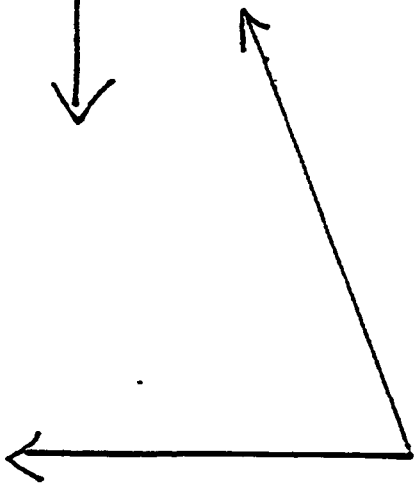
2.



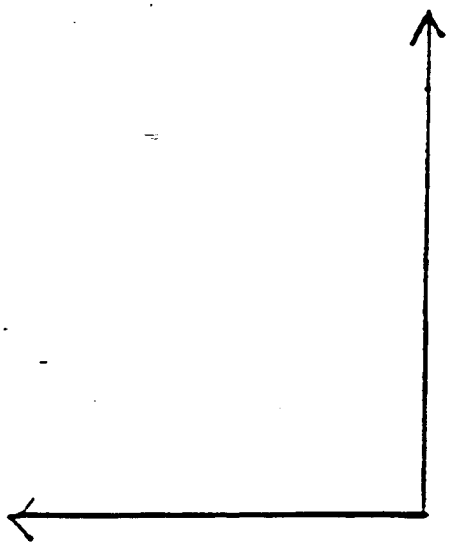
3.



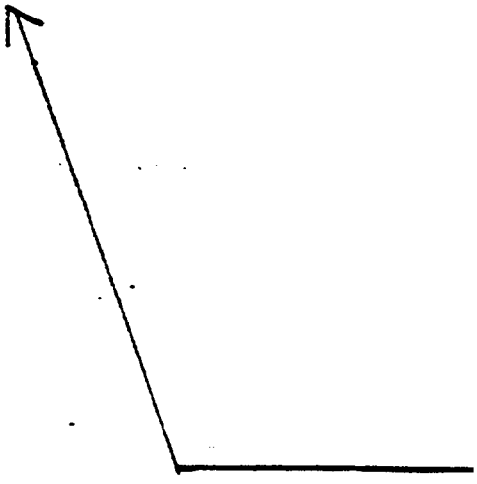
4.



5.



6.



50°	75°	40°
80°	25°	55°
90°	20°	100°
115°	125°	170°
160°	180°	135°

Objective 5: Define a 90° angle as a right angle Identify and draw parallel, perpendicular, and intersecting lines.

Vocabulary

right angle
acute angle
obtuse angle
straight angle
intersecting
perpendicular
parallel
to check
to extend

Materials

Protractors
Blank paper
Straight edges
Geoboards and bands
Geostrips and brads
Overhead projector
Practice Quiz
Quiz
Worksheet - 1/student
•Parallel, Intersecting and Perpendicular Lines

Language Foundation

1. It may be necessary to explain that "to check" means to compare, or in this case to test or measure. You **check** to see if 2 things are the same or different.

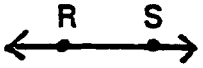
2. Explain that **extend** means to make longer.

3. For homework students are to draw a diagram and then to write what intersecting, perpendicular, and parallel lines are. Students should be encouraged to do this in their own way. The purpose of the assignment is to see if the concept is there and if the vocabulary is being used correctly regardless of spelling, grammar, punctuation, etc. For those students having a great deal of difficulty, model an explanation of intersecting lines for them.

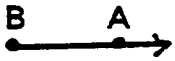
Mathematics Component

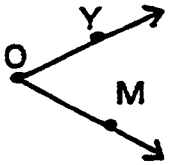
1. Give each students the Practice Quiz. Allow 5-8 minutes for students to complete it. Then explain that tomorrow there will be a quiz on these same items. If everyone in their group gets at least 9 out of 12 items correct, there will be a reward (candy, fruit, no homework, etc.). Allow 5 minutes for the groups to teach each other.

KEY TO PRACTICE QUIZ

1. $\overleftrightarrow{MN}$
2. $\overline{RS}$
3. point A
4. $\overrightarrow{XY}$
5. $\overrightarrow{DC}$
6. $\overline{HG}$
7. $\angle HGM$
8. $\angle STJ$
9. 

10. T •
11.

12. 

13. 

2. Review measuring an angle with a protractor. Have students measure the angle formed by the corner of their paper and compare their measurements. Explain that this special angle which measures 90° is a right angle. Remind students that the use of the term "right" does not refer to direction or placement but to <u>any</u> angle which measures 90°. Have each group make a list of 6 right angles in the classroom. Show them how to use the corner of their pages to check to see if the angle is a right angle.

3. Have students draw a right angle on their paper using their protractors. Do the same on the overhead and show them how to extend the rays beyond the endpoints. Ask them how many right angles they have formed by doing this. We say these two lines intersect in a right angle. We call these lines that intersect in right angles **perpendicular**.

4. Draw two lines that intersect which are not perpendicular on the overhead, and ask the students to tell you what they know about these lines. Now draw two lines that are perpendicular and ask what they know about these lines. Then explain that some lines will never intersect. Draw an example of parallel lines and explain that lines that will never intersect are called parallel. Beside the parallel lines, write the word **parallel** and indicate the parallel "l's" in the word.

5. Have the students use the geoboards to demonstrate parallel lines, perpendicular lines, and intersecting lines that are not perpendicular. You can sing the following "geometric lines" to the tune of "Row, row, your boat":

♪ Per pen dicular lines
Intersect at right angles
Parallel, parallel, parallel, parallel
Two lines that never meet. ♪

6. Give out Parallel, Intersecting and Perpendicular Lines worksheet to students and have them complete it in pairs. You can assign the back of this worksheet for homework. They are to draw pictures in each section showing the term and then write their own description of each drawing. (See the Language Foundation section for guidance with this assignment.)

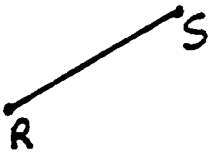
7. Discuss smaller than and greater than. Use some concrete examples such as giving a student 4 geoboards and keeping 2. Make the following statement: "4 is greater than 2, and 2 is smaller than 4." Pass out geostrips and brads and ask students to make a right angle. Now ask them to make an angle that is **greater** than 90° and one which is **smaller** than 90°. Tell them that these are called **obtuse** and **acute**. Draw an angle which measures 180° on the board and point out that it is called a **straight** angle.

Practice Quiz

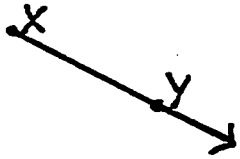
Name _____

Write the name for each drawing:

1.

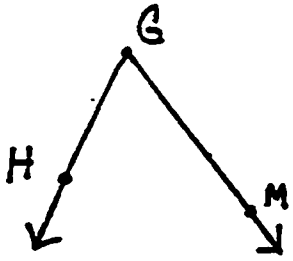
2. 

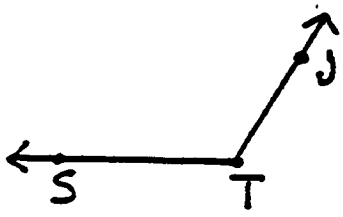
3.

4. 

5.

6.

7. 

8. 

Draw and label each of these:

9. $\overleftrightarrow{RS}$

10. T

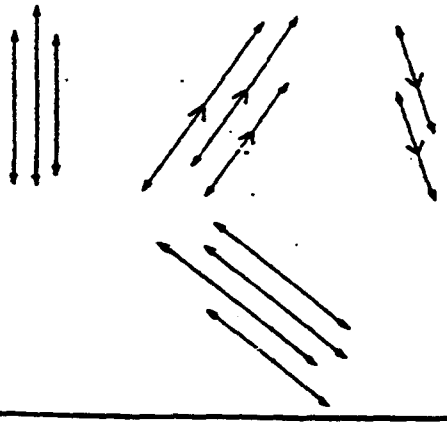
11. $\overline{YZ}$

12. $\overrightarrow{BA}$

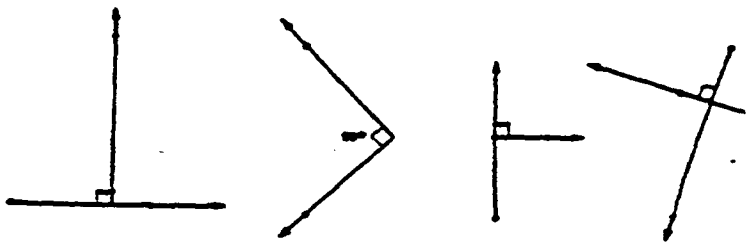
13. $\angle YOM$

Parallel, Intersecting and Perpendicular Lines

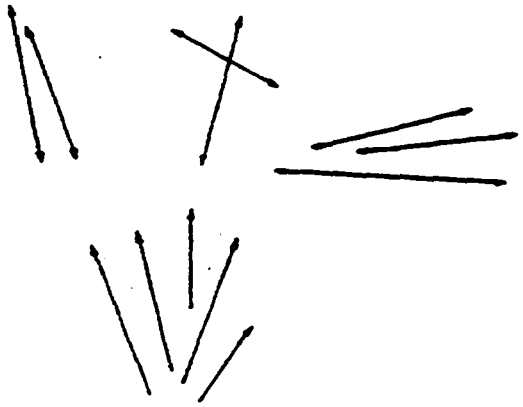
These lines are parallel to each other:



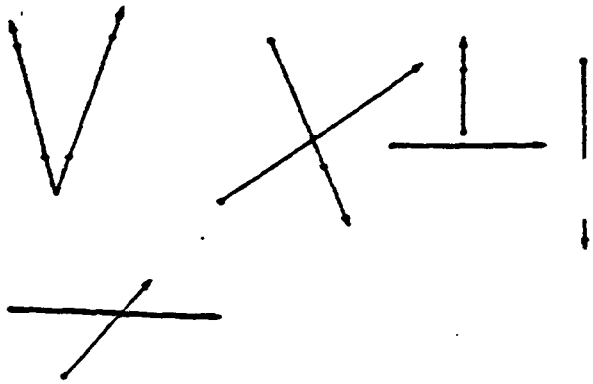
These rays and segments are perpendicular to each other:



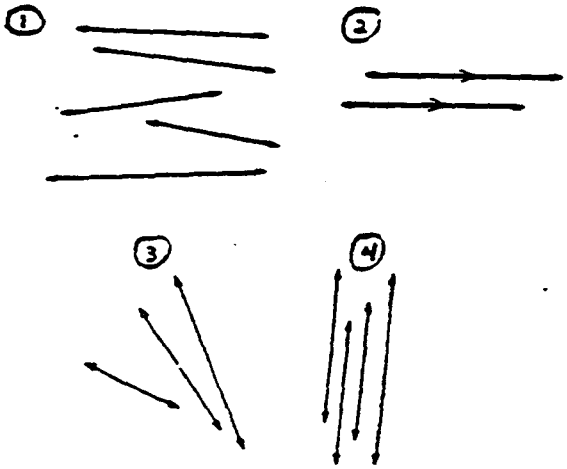
None of these lines are parallel to each other:



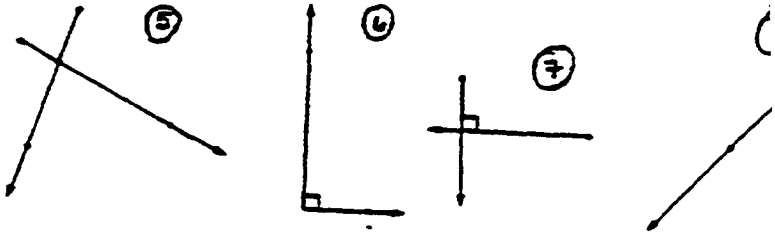
None of these are perpendicular:



Which lines are parallel?

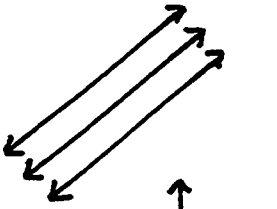


Which of these are perpendicular?

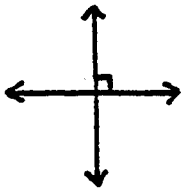


QUIZ Name _____

Parallel, Perpendicular, Intersecting

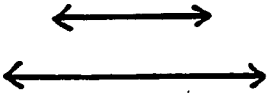


1. The lines are _____.

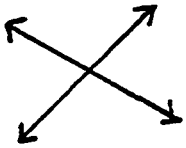


2. The lines are _____.

3. The lines are _____.



4. The lines are _____.



5. The lines are _____.

6. Draw 2 parallel lines.

7. Draw 2 perpendicular lines.

Draw and label:

8. point X

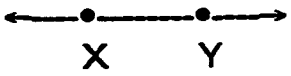
9. $\overline{MN}$

10. $\overrightarrow{CD}$

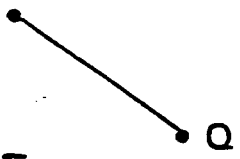
11. $\overleftrightarrow{HG}$

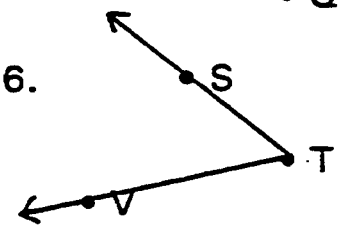
12. $\angle CAD$

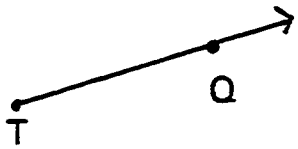
Write the symbol:

13. 

14.

15. 

16. 

17. 

intersecting	perpendicular	parallel

Objective 6: Sort and classify figures as open or closed. Define a polygon as a simple closed curve made of line segments.

Vocabulary

open
closed
polygon
simple

Materials

Blank sheets of paper
2/student
Colored pencils or
magic markers
Geoboards and bands
Transparencies and
Worksheets:
•Is It a Polygon or
Not?
•Dot Paper
1/group of 4 students
Quiz
1/student

Language Foundation

1. Use this opportunity to review vocabulary covered thus far in this unit.

Mathematics Component

1. Give the students the quiz.

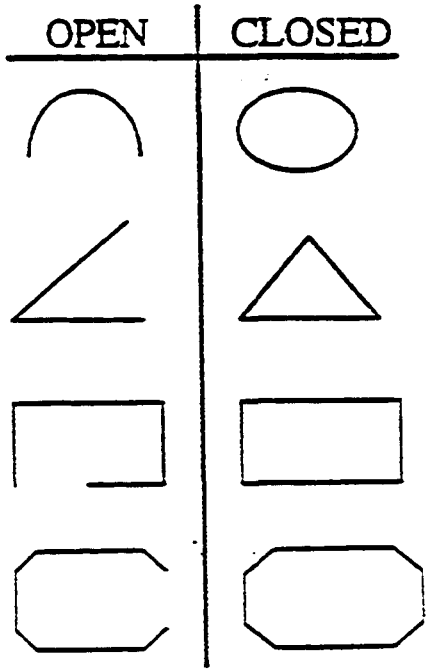
2. Give each student 2 sheets of white paper. Have them draw one large simple closed curve on one sheet and one large complex closed curve on the other sheet. Point out that we use the word **simple** for lines that **do not cross each other**. You may want to have students trade both papers with someone. Make the simple closed curve into a picture of a person, object or scene, and the complex closed curve into a colorful multi pattern design. You can display the "curve art" on your bulletin board, around the room.

3. Have the students use one rubber band to make a shape on the geoboards. As they finish sort them into polygons and nonpolygons. Write the word **polygons** over that group and **nonpolygons** over the other group. Have the students work in pairs or cooperative groups to write a definition of a polygon. (This may be difficult and may need to be a whole group, teacher directed activity.) Collect their ideas and combine them until you have "simple, closed curve made of line segments."

4. Have students in groups of four. Give each group a copy of Is It a Polygon or Not worksheet. Have each student duplicate the figures on a geoboard. Have the students then decide which are polygons and which are not.

5. Have students make a polygon on the geoboard and then record it on dot paper. Model this on the overhead first. Have them make another polygon and trade with a friend. Record the friend's polygon on dot paper.

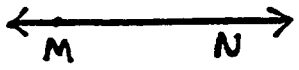
6. On the board (or overhead or a wall chart) draw the following chart and discuss it.

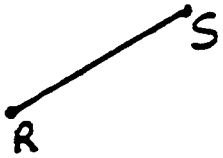


Quiz

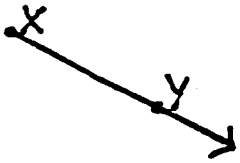
Name _____

Write the name for each drawing:

1. 

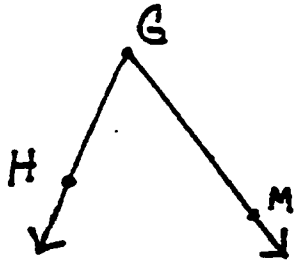
2. 

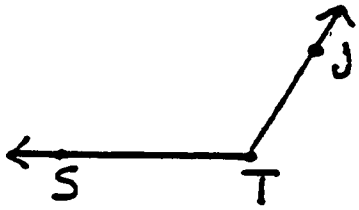
3.

4. 

5.

6.

7. 

8. 

Draw and label each of these:

9. $\overleftrightarrow{RS}$

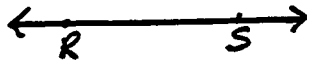
10. T

11. $\overline{YZ}$

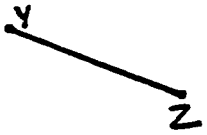
12. $\overrightarrow{BA}$

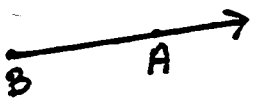
13. $\angle YOM$

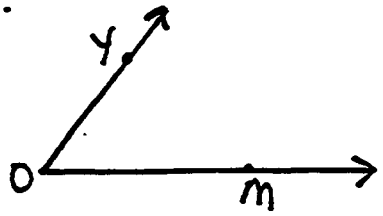
Key to Quiz

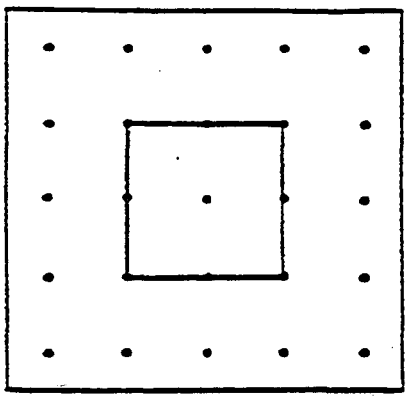
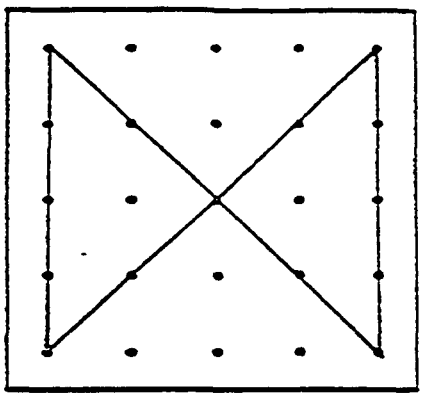
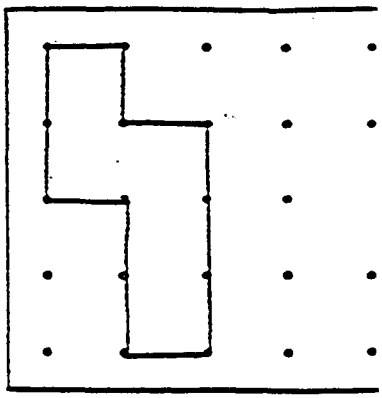
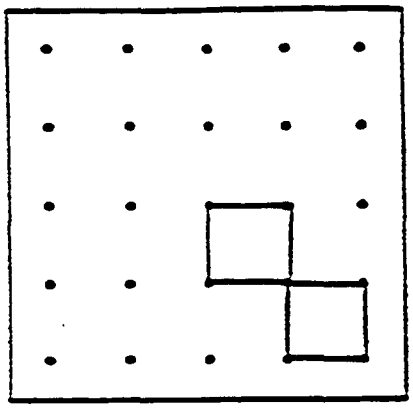
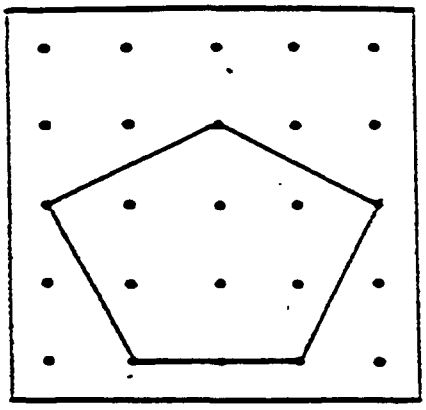
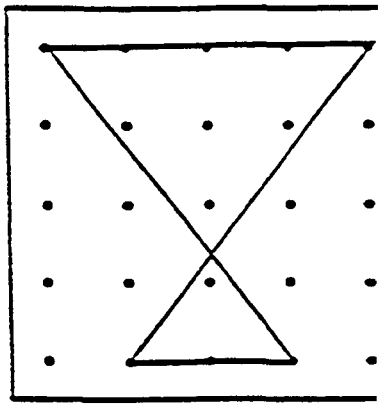
1. $\overleftrightarrow{MN}$
2. $\overline{RS}$
3. A
4. $\overrightarrow{XY}$
5. $\overrightarrow{DC}$
6. $\overline{HG}$
7. $\angle HGM$
8. $\angle STJ$
9. 

10.

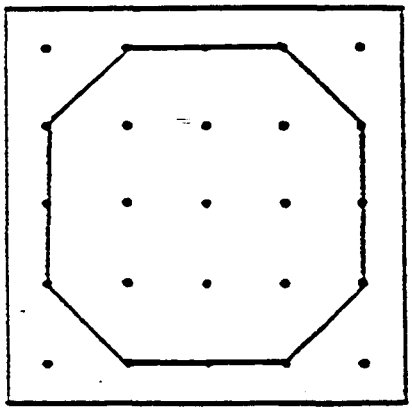
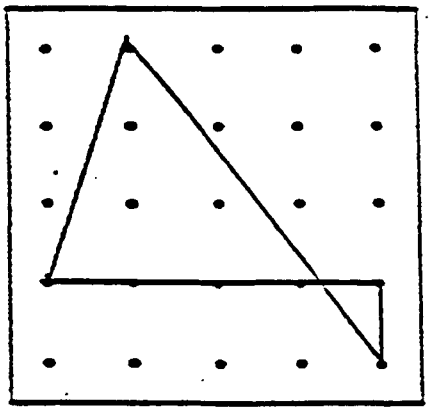
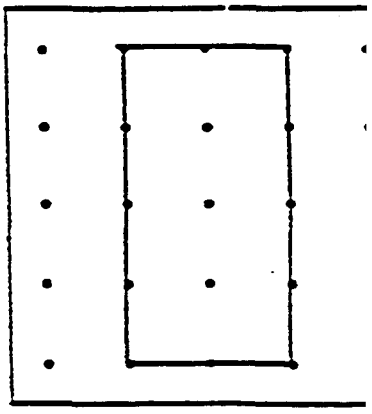
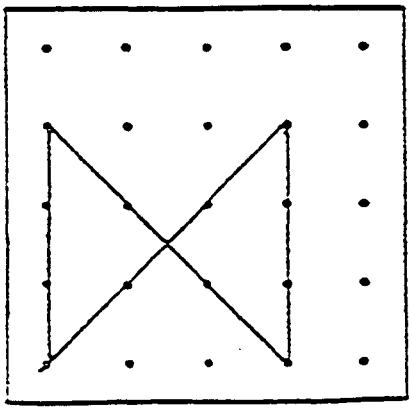
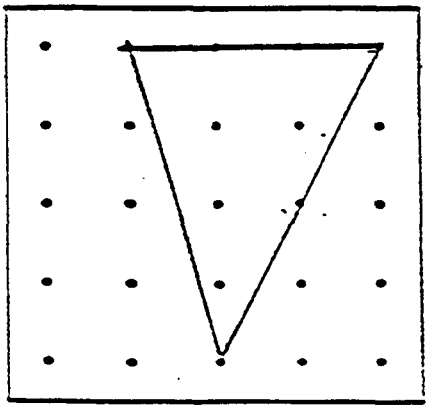
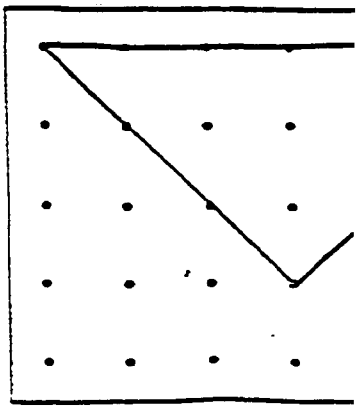
11. 

12. 

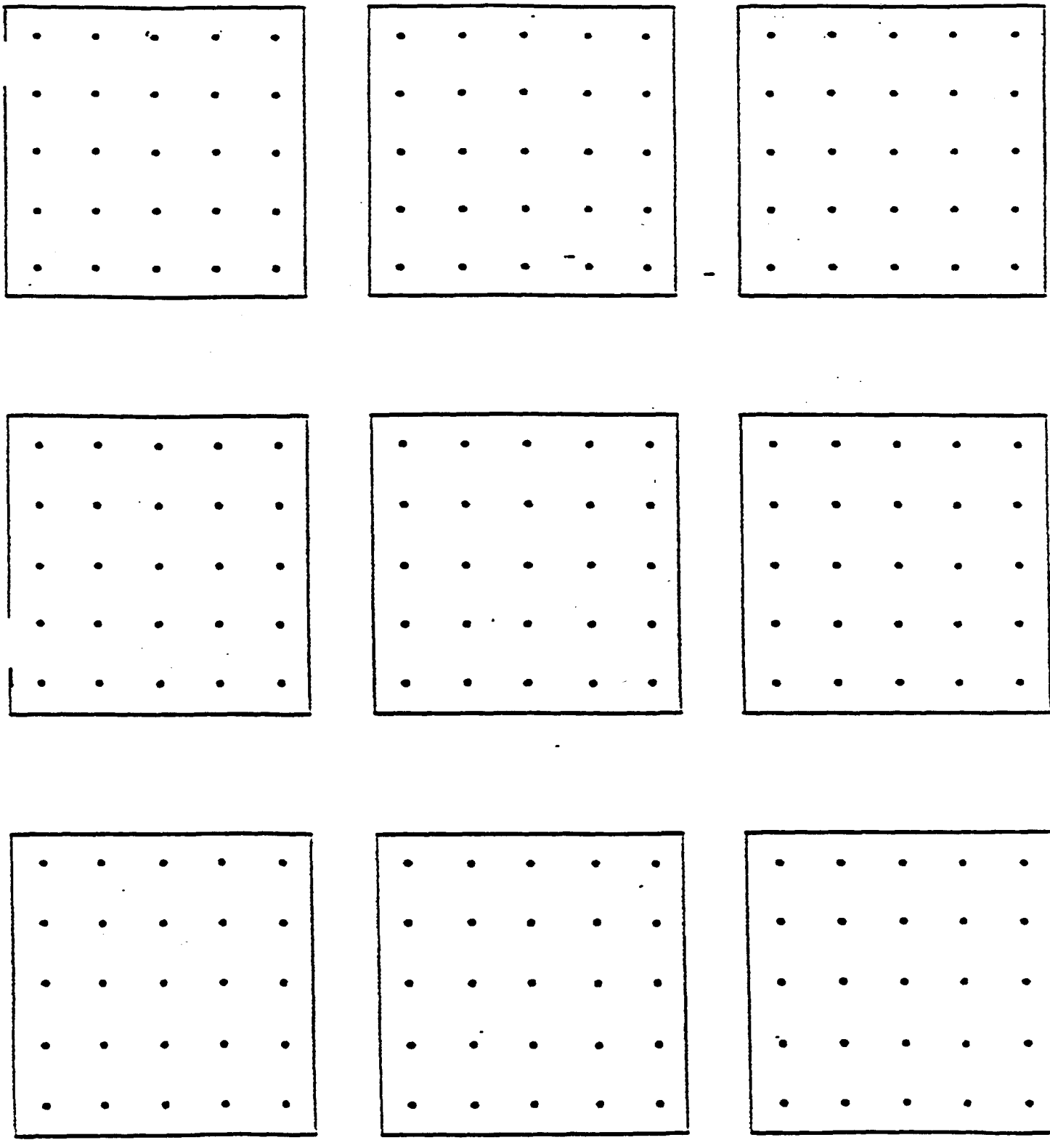
13. 

Is It a Polygon or Not?

Dot Paper



Objective 7: Identify a three sided polygon as triangle, and sort triangles by their angles -acute, right, and obtuse.

Vocabulary

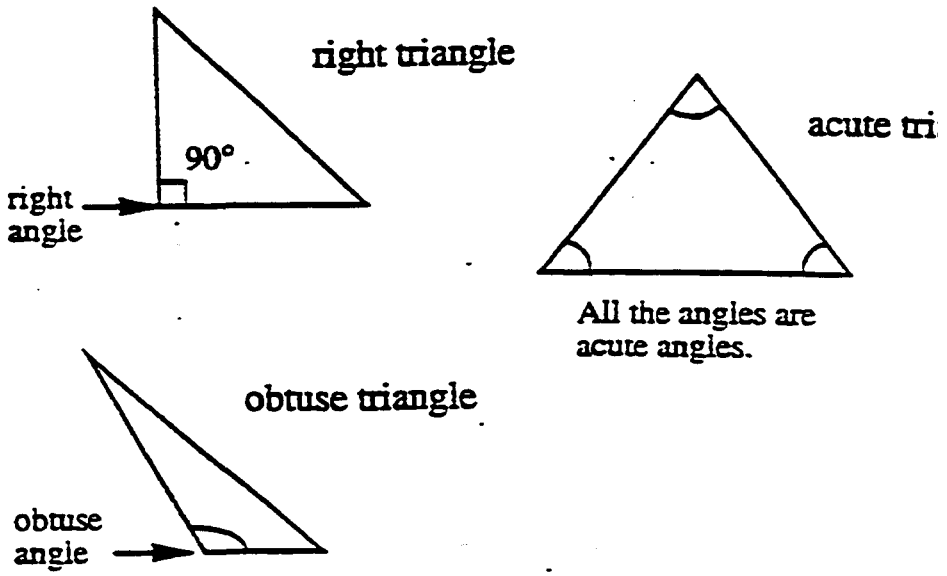
triangle
acute
right
obtuse

Materials

Overhead geoboard
Geoboards
Geostrips and brads
Worksheets:
•Review Worksheet - Angles
•Acute, Right and Obtuse Triangles
•Measuring Angles of Triangles
•Drawing and Defining Triangles

Language Foundation

1. Review angles and especially right angles.
2. Review polygons and the definition of the word. Tell them we are going to spend the next four classes talking about special groups of polygons.
3. Some students may not be ready to try to put 2 right angles (or obtuse angles) in a triangle. You will need to decide if you should try this activity with your class.
4. Add the following to the wall chart



Mathematics Component

1. Review the names of angles (right, acute, obtuse). Have students do the Review Worksheet - Angles.

2. Have students make a three sided polygon. Ask its name. Have students make a triangle with the following and have them compare their triangles:

   - 1 peg in the middle
   - 4 pegs on each side
   - the smallest possible triangle
   - the largest possible triangle
   - a triangle with a right angle.

3. Have students show their triangles with right angles. Have them check their right angle with a corner of their paper (or a square orange pattern block). Tell them that a triangle with a right angle in it is a right triangle. Make a triangle with two right angles. (Let the students discover that it can't be done.)

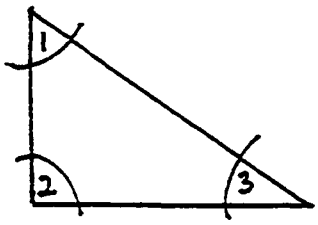
4. Have a student make a right triangle. Make an obtuse triangle on the overhead geoboard and compare the two. Elicit that a triangle with an angle greater than a right angle is called an obtuse triangle. Show them how to measure the angle with a paper corner. Have them each make an obtuse triangle, check it, trade with a partner and check that angle. Ask if they think a triangle can have two obtuse angles.

5. Have the students work together in groups to make a triangle in which all the angles are less than right angles. Have them all check to be certain. Define this triangle as acute.

6. Give out the geostrips and tell students to make different triangles. As a group, students can sort and classify the triangles by their angles : acute, right or obtuse.

7. Pass out Acute, Right and Obtuse Triangles worksheet to help students define obtuse, acute and right triangles. They may work in pairs or cooperative groups.

8. The Measuring Angles of Triangles worksheet will review the use of protractors and allow a double check of the total of angles adding to 180°. To make this concept more concrete, ask students to draw a right triangle, mark the three angles, then cut them up and glue them together to make a straight angle.



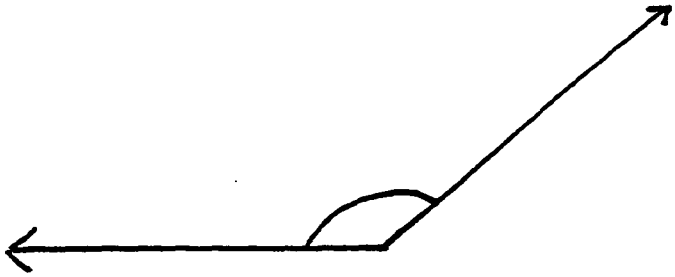
9. For homework, pass out the Drawing and Defining Triangles worksheet. Model drawing a right triangle by first drawing the right angle and then drawing the third side. Ask students to tell you what they would do to draw an obtuse triangle, and an acute triangle. A sample of one student's work follows.

Review Worksheet - Angles

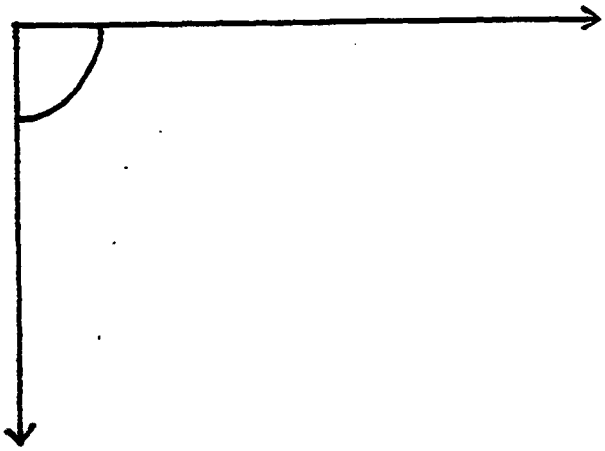
Measure each angle.

Label each angle <u>right, acute, or obtuse</u>:

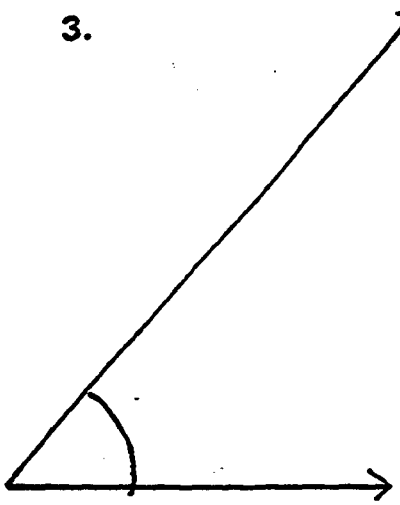
1.



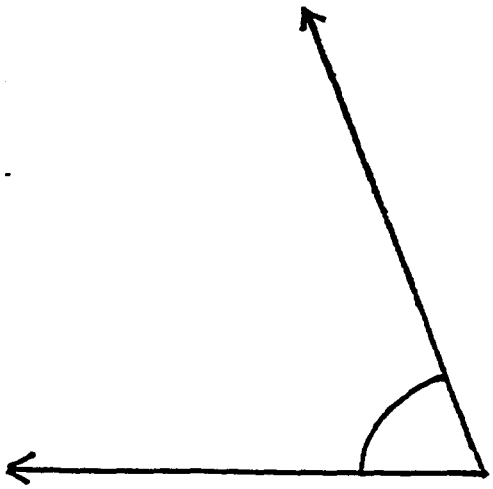
2.



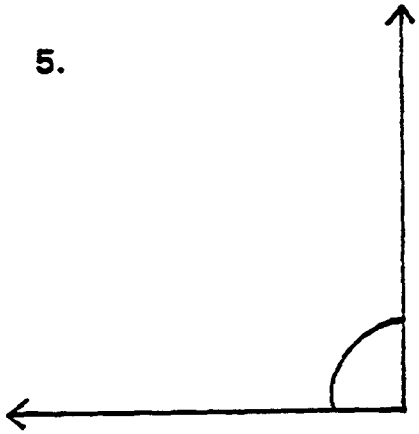
3.



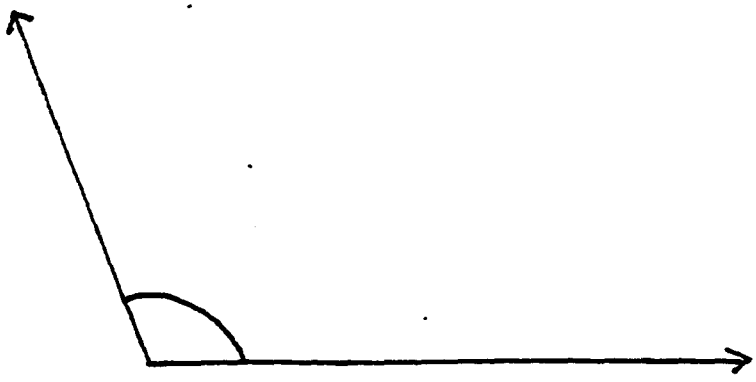
4.



5.

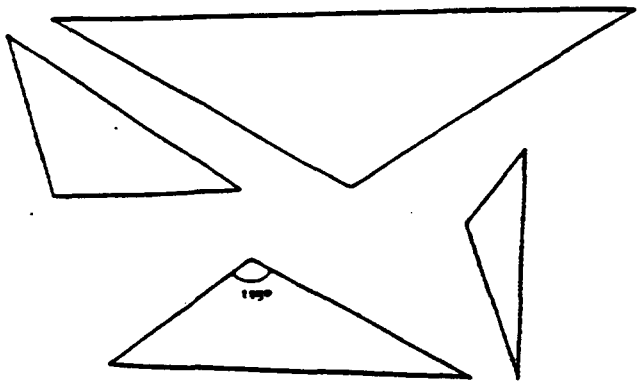


6.

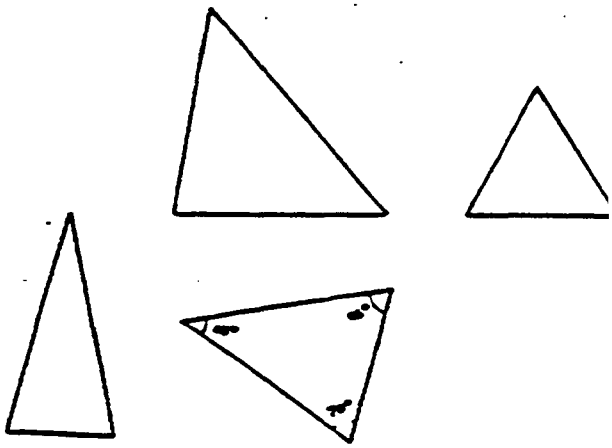


Acute, Right and Obtuse Triangles

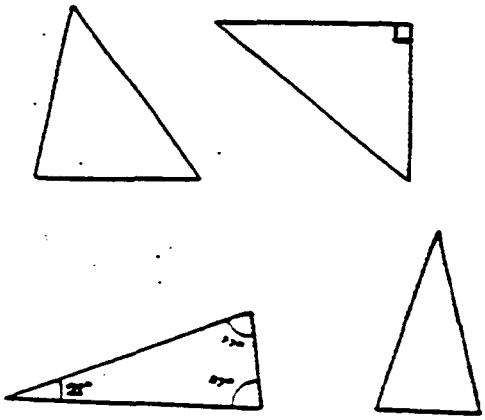
Each of these is an obtuse triangle:



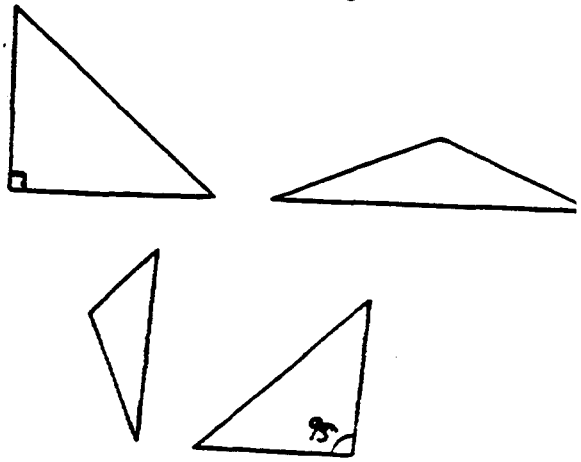
Each of these is an acute triangle:



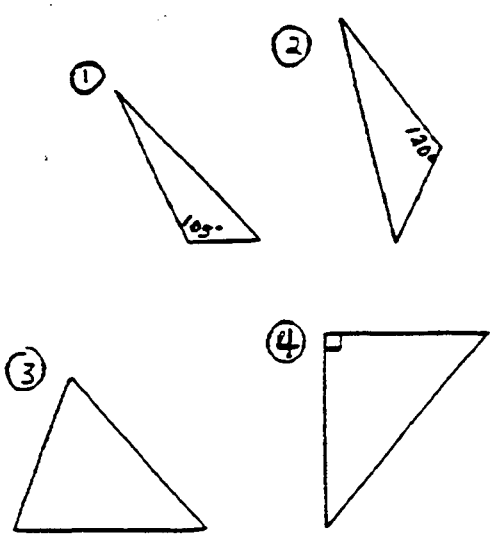
None of these is an obtuse triangle:



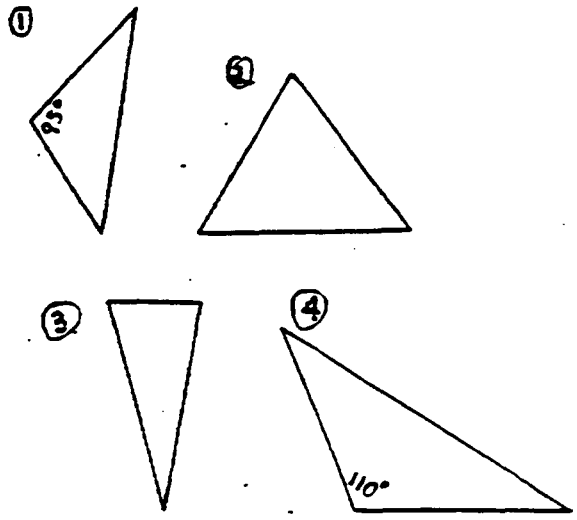
None of these is an acute triangle:



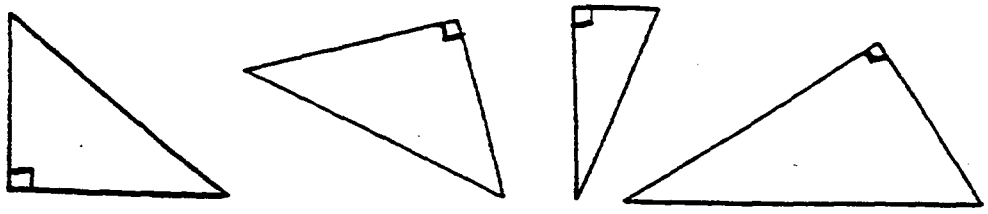
Which of these is an obtuse triangle?



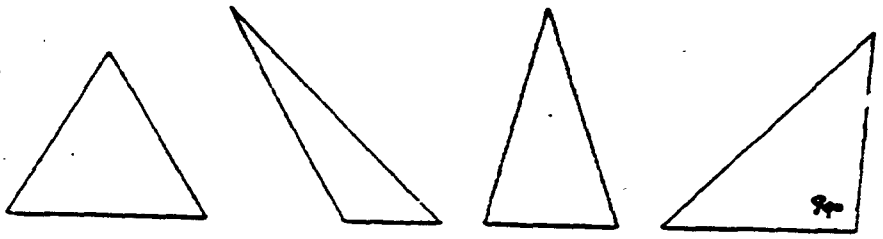
Which of these is an acute triangle?



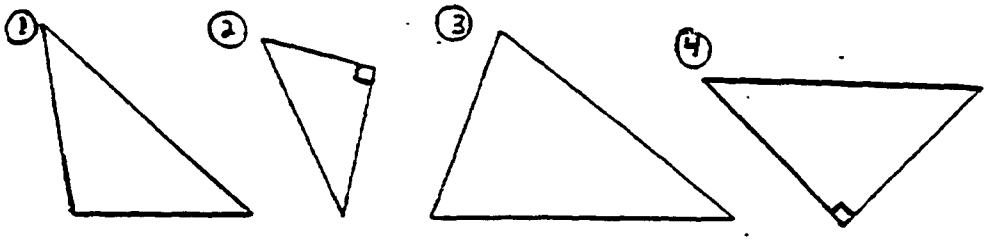
Each of these is a right triangle:



None of these is a right triangle:



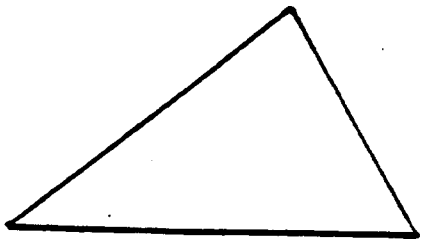
Which of these is a right triangle?



Measuring Angles of Triangles

Measure the angles. Write the measure in the vertex of the angle.
Label the triangles.
Add the measures of the angles.

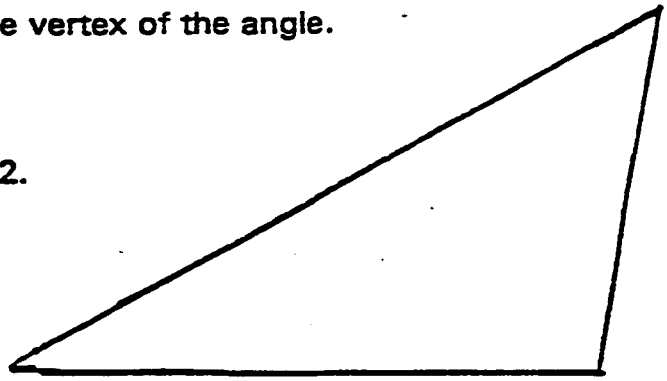
1.



_____

Total = _____

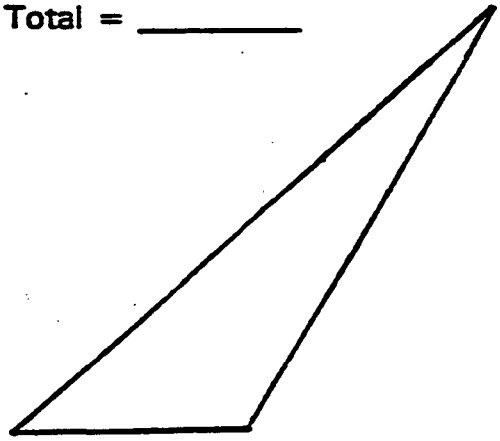
2.



_____

Total = _____

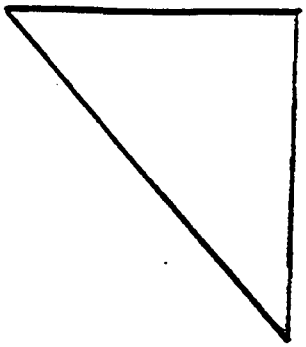
3.



_____

Total = _____

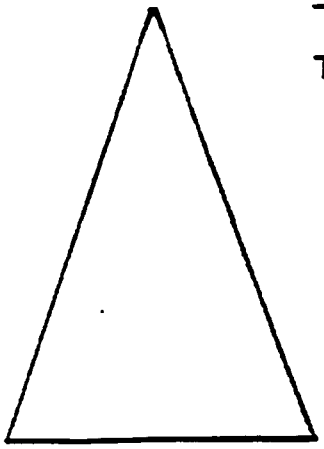
4.



_____

Total = _____

5.



_____

Total = _____

Drawing and Defining Triangles

Homework

Name _____

Draw a right triangle:

What is a right triangle? (in words.)

_____

_____

_____

Draw an obtuse triangle:

What is an obtuse triangle? (in words)

_____

_____

_____

Draw an acute triangle:

What is an acute triangle? (in words)

_____

_____

_____

Objective 8: Sort and classify triangles by relative length of side: equilateral, isosceles, and scalene.

Vocabulary

rule
equilateral
isosceles
scalene

Materials

Overhead geoboard
Geoboards and bands
Quiz
Worksheets:
•Triangle Worksheet*
•Classifying Triangles
1/student

*2/student (1 for classwork and 1 as a quiz the next day)

Optional software:
Geometric Supposer
"Classifying Triangles Lab"
•Lab Directions
1/student
•Data Sheet
3/student

Language Foundation

1. Tell the students they will sort things in these lessons. Explain that when we sort things, they are put in groups based on a rule. Remind them that they sorted shapes 2 days ago into shapes that are polygons and the shapes that are not. You need to do another sorting activity such as students wearing red and students not wearing red.

2. Discuss that when we talk about line segments in geometry being equal, we mean equal in length. Two equal line segments can go in different directions

3. Use an extra day for this lesson so students can use the protractor to draw triangles to
    a. Gain protractor skills
    b. Absorb classifying triangles by sides versus classifying by angles.

4. Use the letter cards to play spelling vocabulary games using questions such as
    a. Spell the name of a triangle with 3 equal sides.
    b. Spell the angle that is equal to 90°

Mathematics Component

1. Review right, obtuse, and acute triangles on geoboards or geostrips.

2. We can sort by angles. How else can we sort? (Elicit by length of side.)

   Have each student make a triangle. Put them on the chalk tray. Sort students' triangles by sides. What do they notice? "Are all sides the same length? Are all sides different lengths? Are two sides the same length?"

   Point out that triangles with **three equal** sides are called **equilateral**, triangles with **two equal** sides are called **isosceles** and triangles with **no equal** sides are called **scalene**. Form some triangles and have students tell you where to place them.

3. Ask students to form triangles by definition and show them to you.

4. For homework have students complete the Triangle Worksheet.

5. Optional for high schools and middle schools: *Geometric Supposer* is on most math lab networks. Use the Lab Directions worksheets. Set up triangles on each computer. This can be done using Lanschool and locked so that students cannot erase figures as they work. Each computer screen should show a triangle drawn by choosing to create your own triangle and then choosing in turn acute, right or obtuse and equilateral, isosceles or scalene. Have students move from one computer to another as they complete the measurements and replace the triangles yourself. Students are to measure each triangle's sides and angles, add the measures of the angles and classify the triangles by angle and by side. Directions for measuring are given on the student lab sheet. Do not use the back of the directions for a data sheet as the students will need to refer to the directions repeatedly.

<u>Teacher Notes for Using Geometric Supposer: Triangles</u>

Set up triangles on each computer. This can be done using Lanschool and locked so that students cannot erase figures as they work. Each computer screen should show a triangle drawn by choosing **create your own triangle** and then choosing in turn **acute, right, or obtuse and equilateral, isosceles, or scalene**. Have students move from one computer to another as they complete the measurements. Replace the triangles yourself. Students are to measure the sides and angles of each triangle, add the measures of the angles, and classify the triangles by angle and side. Directions for measuring are given on the student lab sheet. Do not use the back of the directions for a data sheet as the students will need to refer to the directions repeatedly.

Triangle Worksheet

Name_____

1. Draw an equilateral triangle.	2. Draw a right triangle.
3. Draw an obtuse triangle.	4. Draw a scalene triangle.
5. What is an isosceles triangle?	6. What is an acute triangle?

Classifying Triangles

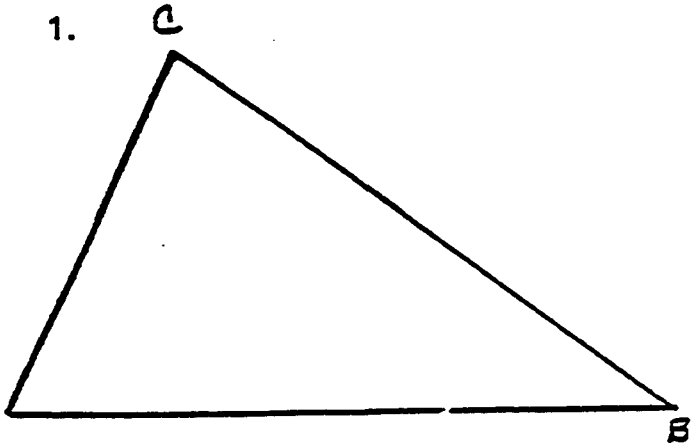
Use a ruler and a protractor.

Measure the angles and the sides of each triangle.

Write the measures on the triangles.

Classify each triangle by side and by angle.

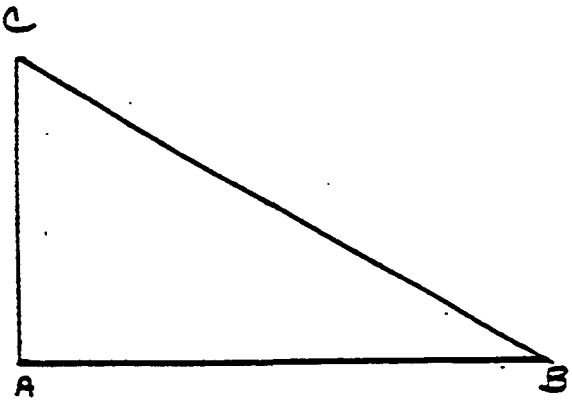
1.



Classify by angle: _____

Classify by side: _____

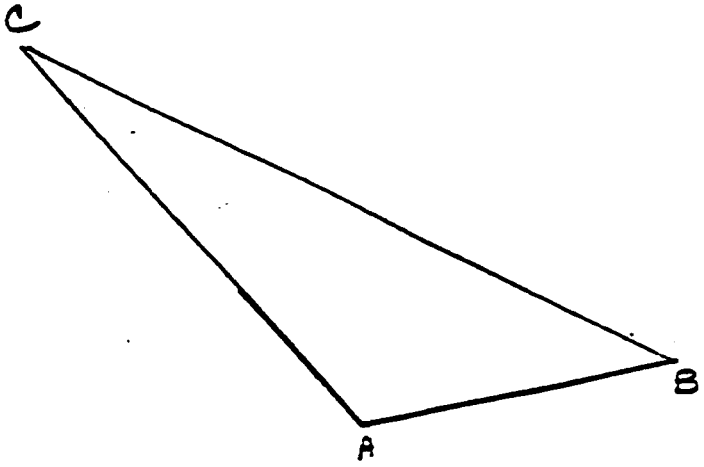
2.



Classify by angle: _____

Classify by side: _____

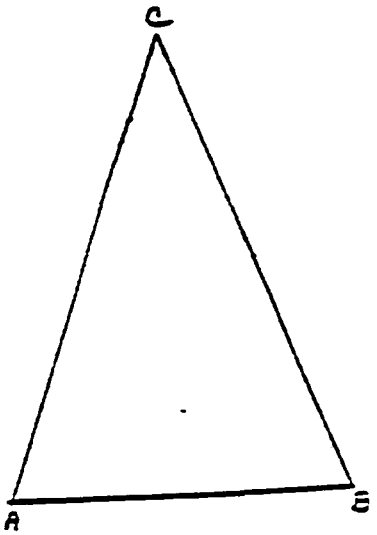
3.



Classify by angle: _____

Classify by side: _____

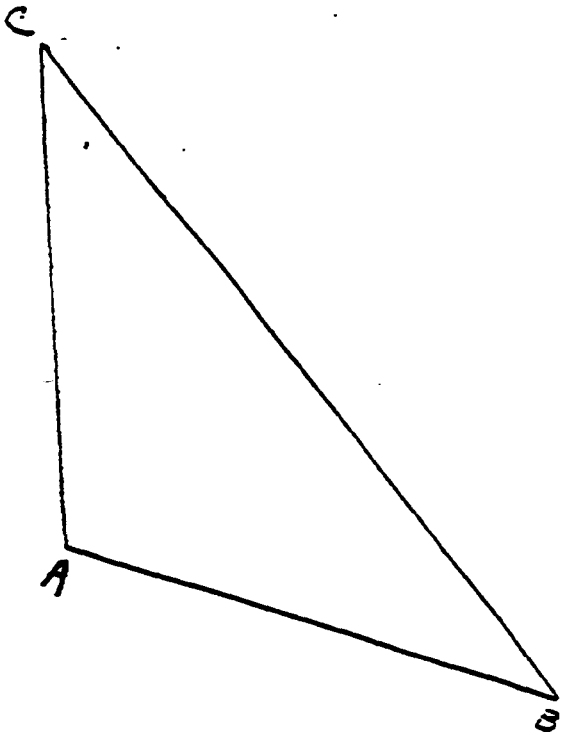
4.



Classify by angle: _____

Classify by side: _____

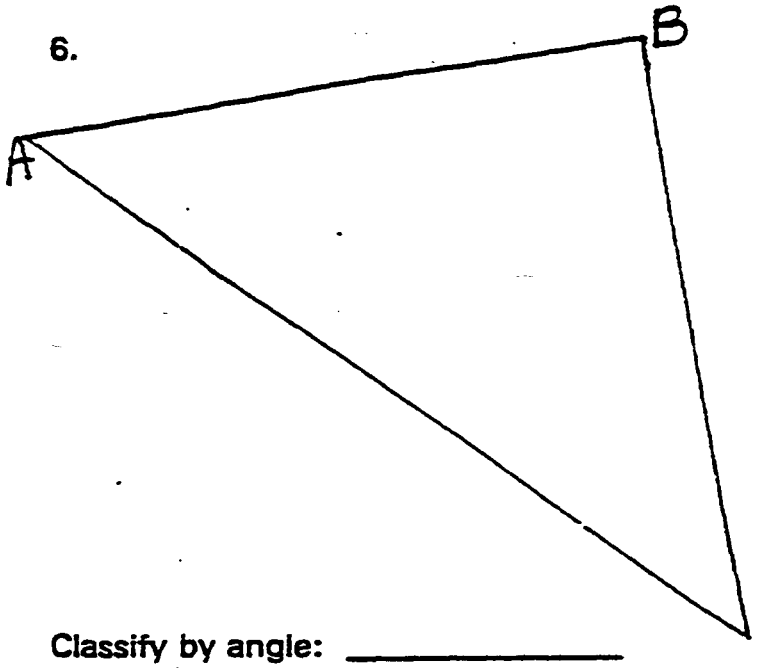
5.



Classify by angle: _____

Classify by side: _____

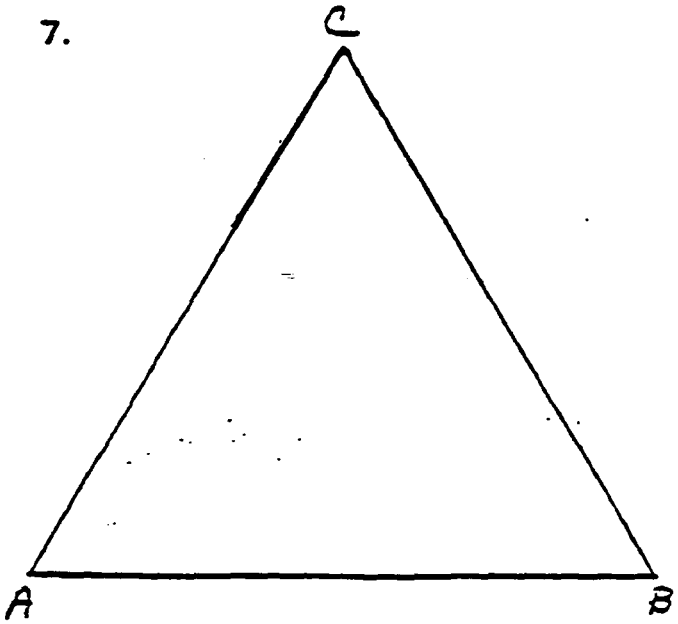
6.



Classify by angle: _____

Classify by side: _____

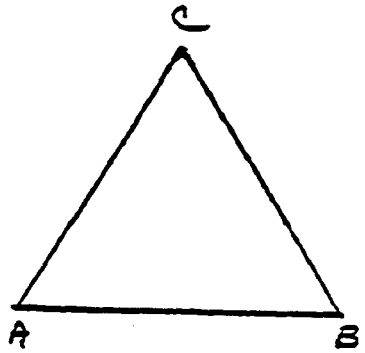
7.



Classify by angle: _____

Classify by side: _____

8.



Classify by angle: _____

Classify by side: _____

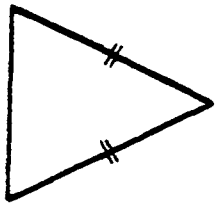
Quiz

Name_____

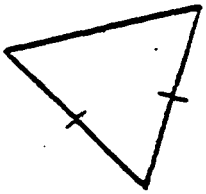
Classify each triangle as scalene, isosceles or equilateral:

1.

_____

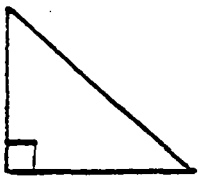
2. 

_____

3. 

_____

Classify each triangle as obtuse, right or acute:

4. 

_____

5.

_____

6.

_____

Lab Directions

Choose M (measure).

Choose 1 (angle).

ABC Enter Enter Space Bar

BAC Enter Enter Space Bar

ACB Enter Enter Space Bar

Esc.

Choose 2 (length of segment).

AB Enter Enter Space Bar

AC Enter Enter Space Bar

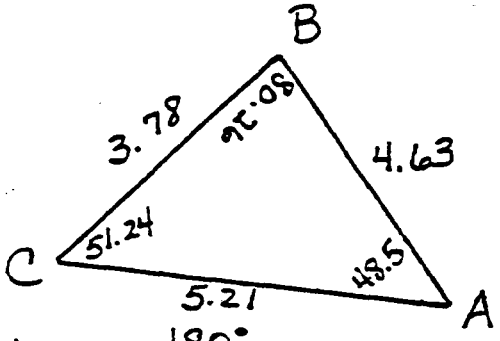
BC Enter Enter Space Bar

Copy the triangle on your paper.

Write the measure of each angle on your triangle. Add.

Write the measure of each side on your triangle.

EXAMPLE:



80.26
51.24
48.5
180.00

Total of angles: 180°

Classify by angle: acute

Classify by side: scalene

Data Sheet

Name_____

Triangle:

Total: _____

Classify by angle: _____

Classify by side: _____

Triangle:

Total: _____

Classify by angle: _____

Classify by side: _____

Objective 9: Know that any polygon with 4 side is a quadrilateral. Identify by number of sides and use the correct names for pentagon, hexagon, and octagon.

Vocabulary

quadrilateral
pentagon
hexagon
octagon

Materials

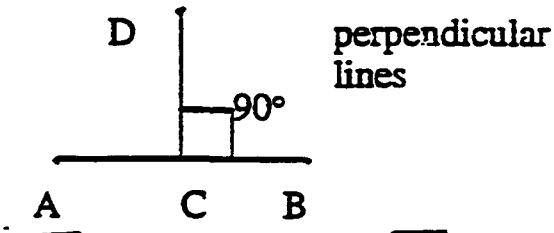
Overhead geoboard
Overhead pattern blocks
Geoboards
Pattern blocks
Triangle Worksheet (page 54) use as a quiz 1/student

Language Foundation

1. You may need to review the idea of congruent meaning exactly the same, and similar meaning the same shape but a different size.

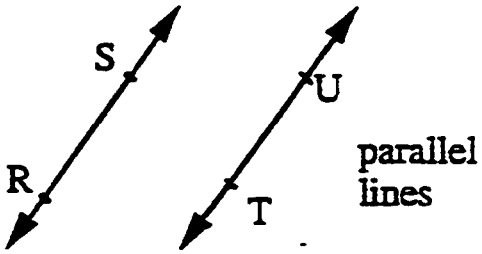
2. A chart with the words triangle, quadrilateral, pentagon, hexagon, and octagon and an example of each will help the students with these words.

3. Add the following to the chart:



perpendicular lines

$\overline{AB}$ is perpendicular to $\overline{CD}$



parallel lines

$\overline{RS}$ is parallel to $\overline{TU}$

Mathematics Component

1. Give students the quiz (page 54).

2. Review triangles by having students form an isosceles right triangle on their geoboards. Have students compare them to see if any are congruent. Repeat with an obtuse scalene triangle.

3. Tell students that all four sided polygons are called quadrilaterals. Put the word on the board. Underline quad and write four under it. Underline lateral and write sides under it. Explain that the word means four sides. Have students make a quadrilateral. Have them find someone with either a congruent or similar quadrilateral and have students tell which their pair is and why.

4. Have students make a five sided polygon. Write the word pentagon on the board. Relate it to the office building.

   Repeat with hexagon. Show them the yellow hexagon pattern block.

   Repeat with octagon. Relate it to a stop sign.

5. Pass out pattern blocks. Have students work together to form a pentagon, a hexagon, and an octagon. Have them trace their answers. (One answer to each block problem.)

   Pentagon - use 2 blues and 1 red
   Hexagon - use 2 blues and 2 reds
   Octagon - Use 1 orange and 4 green.

6. Use the letter cards to spell the vocabulary words given the definition. (i. e. "a five-sided polygon" should elicit "pentagon".)

Objective 10: Classify quadrilaterals by side lengt.. and angle relationships and use the names: square, rectangle, rhombus, trapezoid and parallelogram.

Vocabulary

square
rectangle
rhombus
trapezoid
parallelogram

Materials

Geoboards
Overhead geoboard
Straight edges
Cards for words and definitions
Large letter words and definitions
Wall Chart
12x18 pieces of construction paper
Worksheet:
•Rectangles/Not Rectangles dot paper
•Vocabulary Review

Language Foundation

1. Briefly review the word quadrilateral and the concept of parallel lines. You may wish to have students form a set of parallel line segments on their geoboards.

2. Expect mastery of square, rectangle, and parallelogram. Trapezoid and rhombus may be more than some students can master.

Mathematics Component

1. Put the word **quadrilateral** up on the chalkboard. Draw a line down the center of the board to divide it in half. Have each student make a quadrilateral on a geoboard and sort them into parallelograms and not parallelograms without telling the students how you are sorting them. Ask them to work with a partner to determine the rule for sorting. Put the words parallelograms and not parallelograms and their definition. (Sample sheet follows).

2. Have each student make a quadrilateral that is not a parallelogram. Put up the words trapezoids and not trapezoids. Ask the students to watch as you sort the quadrilaterals to see if they can determine what a trapezoid is. Ask for their ideas. Post the definitions which are included in the following pages.

3. Explain that the parallelograms can be divided further by whether or not they have equal sides and/or equal angles. Tell them that we are starting with equal angles. Have them work together to form a parallelogram with all four angles equal but not equal sides. Put up the word rectangle and ask what they can say about these equal angles. Elicit they are all right angles. Put up the definition.

4. Have the students form a parallelogram with all four equal sides but whose angles are not right angles. Put up the word rhombus and its definition.

5. Make a square on the overhead geoboard and tell the students what it is. Have them make a square and decide where it fits. Elicit that it is a quadrilateral, a parallelogram, a rhombus and a rectangle.

6. Give students the Rectangles/Not Rectangles dot paper and a straight edge. Have follow the directions given on the other side of the page. Some may need to use the geoboards and transfer their answers to the dot paper.

7. For additional reinforcement, give students one of the "large letter" words. Have them glue it to a sheet of construction paper. Have them define the term, classify it (a square is a rectangle and a parallelogram), and draw a model of the word.

8. Make 5 sets of definitions and words. Divide your class into 5 groups and give each group a set. They can play "Memory" with their set of definitions and words.

9. For a review of the geometric terms learned so far, have students create a GEO JEOPARDY game. Students can write the "answers" with the points on the back and then play the game the following day.

10. Give students the Vocabulary Review worksheet and have them complete it in class or for homework.

Quadrilateral
Not Parallelogram
Trapezoid
Not Trapezoid
Parallelogram
Rectangle
Square
Rhombus
Square

Quadrilateral

Parallelogram

Rhombus

Rectangle

Square

Not Parallelogram

Trapezoid

Not Trapezoid

a polygon with 4 sides

a quadrilateral whose opposite sides are parallel and the same length

a parallelogram with 4 right angles

a quadrilateral with only 1 pair of parallel sides

a quadrilateral whose opposite sides are not parallel or the same length

a quadrilateral with no pair of sides parallel

a rectangle with all 4 sides the same length

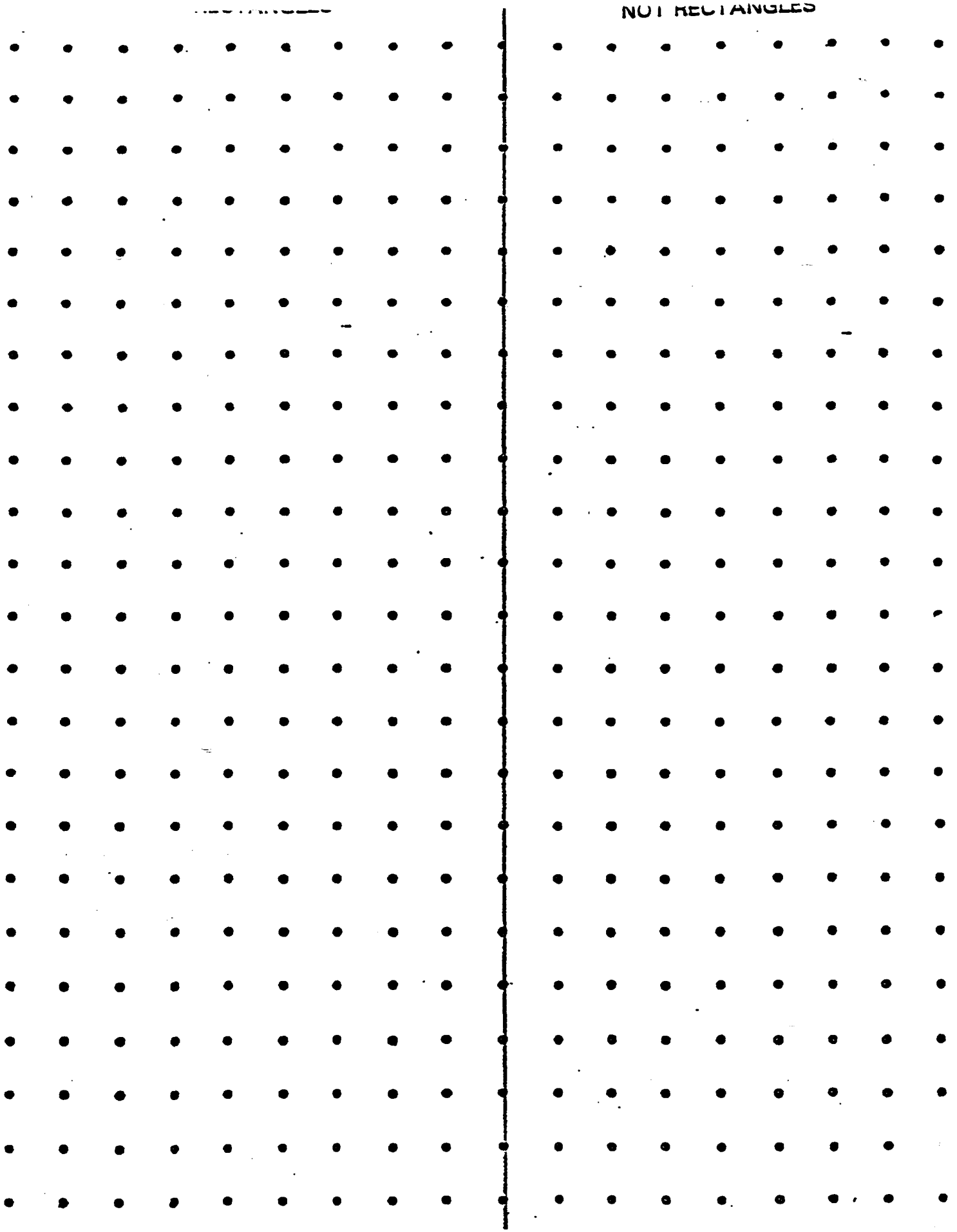
a parallelogram with all four sides the same length

a rhombus with 4 right angles

Rectangles/Not Rectangles Dot Paper Directions

Draw each of these on the correct side of the dot paper.

1. a rectangle
2. a square
3. a rhombus
4. a parallelogram
5. a quadrilateral that is not a parallelogram
6. a trapezoid


NOT RECTANGLES

Vocabulary Review

Name_____

On a separate piece of paper draw and define the following:

1. LINE
2. LINE SEGMENT
3. RAY
4. POINT
5. PLANE
6. POLYGON
7. PARALLEL LINES
8. INTERSECTING LINES
9. PERPENDICULAR LINES
10. RIGHT ANGLE
11. ACUTE ANGLE
12. OBTUSE ANGLE
13. STRAIGHT ANGLE
14. TRIANGLE
15. EQUILATERAL TRIANGLE
16. ISOSCELES TRIANGLE
17. SCALENE TRIANGLE
18. ACUTE TRIANGLE
19. RIGHT TRIANGLE
20. OBTUSE TRIANGLE
21. QUADRILATERAL
22. PARALLELOGRAM
23. RECTANGLE
24. SQUARE
25. RHOMBUS
26. TRAPEZOID
27. PENTAGON

How many sides do these polygons have?

28. HEXAGON
29. OCTAGON

Draw different clocks and indicate the angles the hands make: acute, right, obtuse or straight.

Objective 11: Identify the distance around a plar as its perimeter. Find the perimeter of polygons.

Vocabulary

distance
perimeter
formula
length
measure
m = meter

Materials

Geoboards and bands
Straight edges
Sheets of paper
8 1/2 x 11
Transparencies: 1, 2, 3 and 4
Worksheets:
•Polygons on the Geoboard
•Polygon Dot Paper
•Find the Perimeter
1/student

MECC software-
"Measure Works-
Fence the Animals"
(optional)

Language Foundation

1. Review the concept of measuring to find length. Explain that length is how long something is.

2. Explain that today we are going to find the distance around something. Use a concrete example to show this idea such as the distance around my desk or the distance around my room. Use "How far is it?"

3. The first activity may take a full day, but provides important basic knowledge.

4. Point out that the word **PERIMETER** has **RIM** in it. Students might relate to the rim around the basketball goal.

Mathematics Component

1. Check students' understanding of polygons and the terms square, parallel, and perpendicular by having students do the Polygons on the Geoboards worksheet and record their results on the Polygon Dot Paper. Collect the papers.

2. Put Transparency 1 on the overhead. Tell the students that this is a drawing of a yard and that the people who live here have just bought a new dog so they must put up a fence around their yard. Trace the perimeter as you say "around their yard". Ask the students to work in pairs to decide how long the fence should be. Discuss their answers and how they got them.

3. Point out to students that we call the distance around something its perimeter. Write the word perimeter by the fence and then write P = 220 m. Show them transparency 2 of the perimeter explaining that because our rulers don't bend, we have to measure each side and add the measurements.

4. Pass out 8 1/2 x 11 sheets of paper and straight edges and ask the students to find the perimeter. Have students work in pairs with each student drawing a polygon on his/her sheet of paper. Have students trade papers with their partners and measure the perimeter of each other's polygons.

5. Put transparency 3 on the overhead. Ask students to work in pairs to find the perimeter. Share the results. (They may need to be reminded to find the missing numbers.)

6. Put up transparency 4 on the overhead. Elicit the "missing" measurements. Find the perimeter by adding the 4 threes. Ask students if they can think of a short cut. Elicit 4 x 3. Write P = 4s and tell them this is a formula for the perimeter of a square. We just need to put in the length of the side in place of the s and multiply it by 4. Ask a volunteer to find the perimeter for the 7" square or demonstrate it yourself.

   Repeat this process for the rectangle eliciting the formula P = 2L + 2W.

7. Pass out Find the Perimeter worksheet. Allow students to sum the sides or use the formulas as they prefer. You might want to assign this for homework.

Polygons on the Geoboard

Use the bands to form the polygon. Draw them on the sheet attached:

1. 3 sides 1 square corner no equal sides

   Name your polygon _____.

2. 4 sides no parallel (∥) sides

   Name your polygon _____.

3. 4 sides no equal sides

   Name your polygon _____.

4. 4 sides no square corners 2 pairs of parallel (∥) sides

   Name your polygon _____.

5. 5 sides 1 pair of parallel (∥) sides

   Names your polygon _____.

6. 6 sides 3 pairs of parallel (∥) sides

   Name your polygon _____.

7. 6 sides 1 pair of perpendicular (⊥) sides

   Name your polygon _____.

8. no square corners looks the same no matter how you turn your geoboard

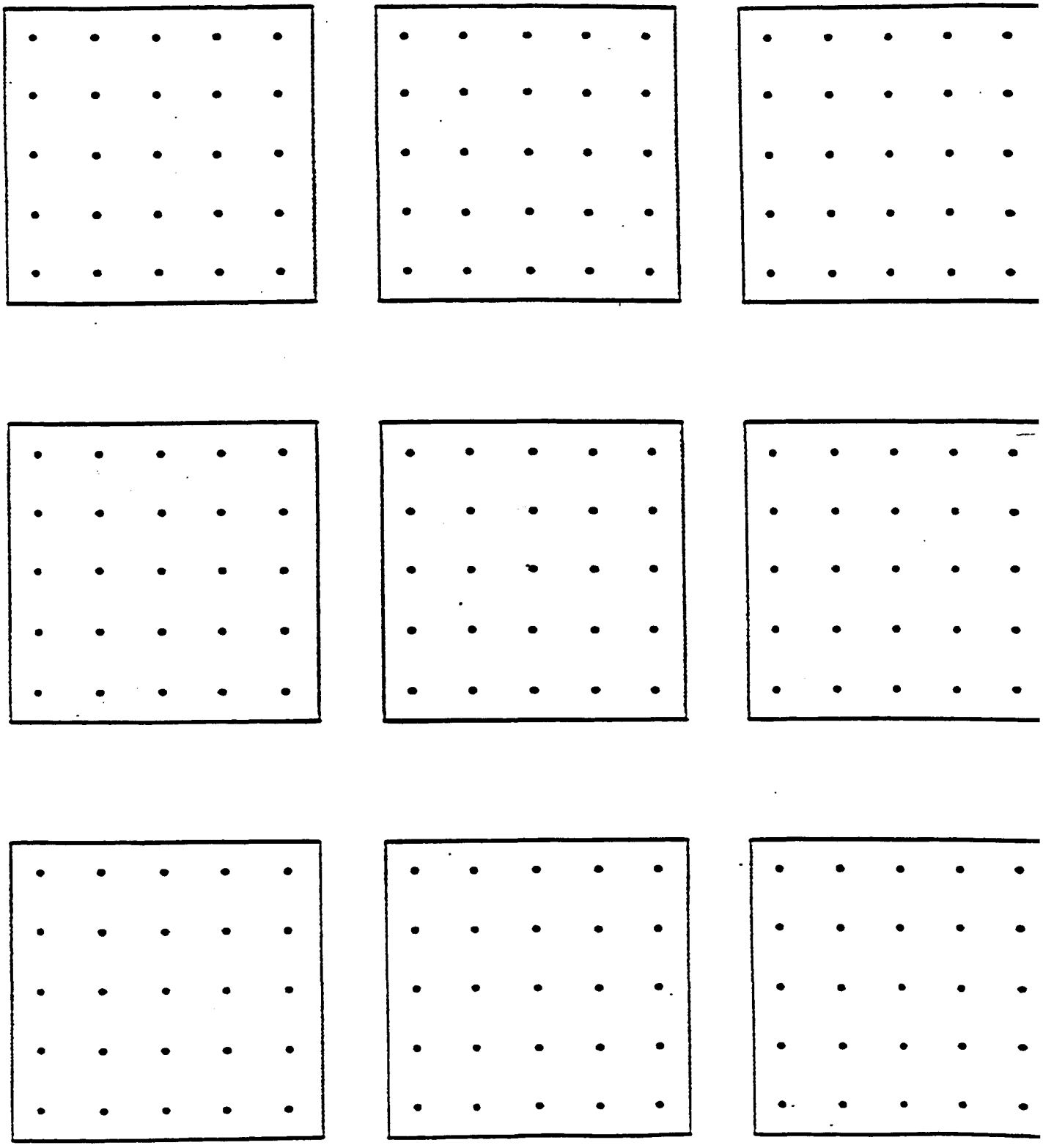
   Name your polygon _____.

9. as many sides as possible
   Your polygon is called a(n) (number of sides) _____-gon.

Polygon Dot Paper

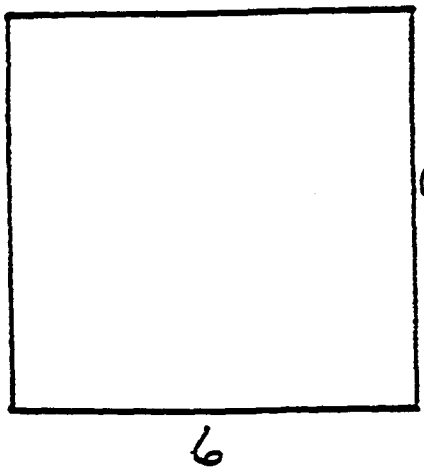
Name_____

Copy your polygons onto this paper:

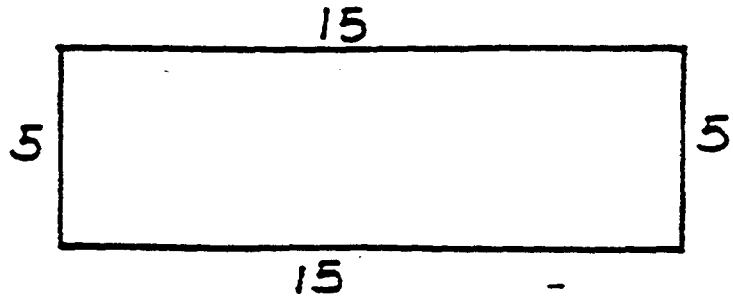


Find the perimeter.

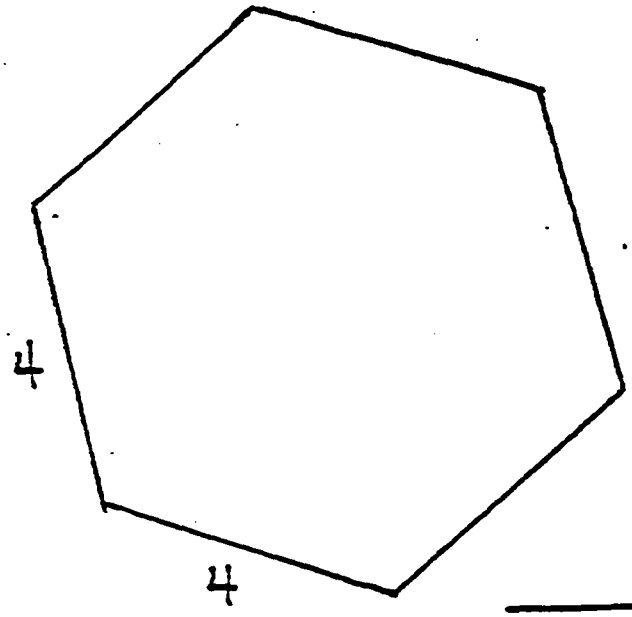
Name _____



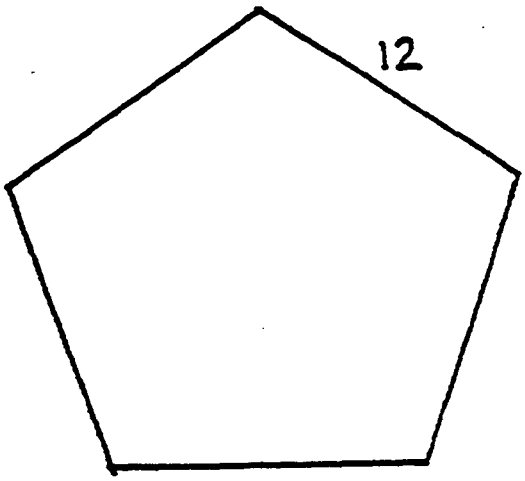
_____



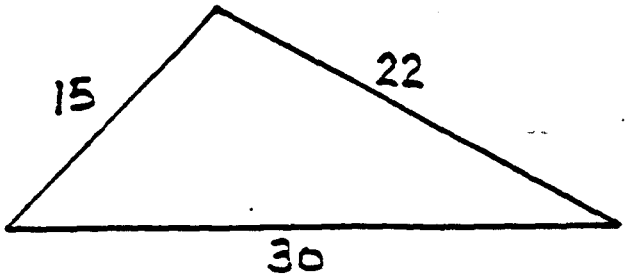
_____



_____



_____



_____